RAILROAD GAZETTE

FRIDAY, FEB. 2, 1894.

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Contributions.

Gold's Universal Straight-Port Steam Coupling.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Ever since the Consolidated Car Heating Company began making the claim that our universal coupling is an infringement upon the Sewall patent, we have been anxious that they should give us an opportunity to test this question in the courts, as we did not put our coupler on the market until we had been advised by careful counsel that there was no possible infringement. Since then the same question has been repeatedly passed on by the counsel for the Western Railroad Association, who holds that there is not the slightest ground for claiming infringement. In the Fall of 1892 the Consolidated Company entered suit against the Cleveland, Cincinnati, Chicago & Indianapolis Railway, and when they found that the suit was to be vigorously defended they suddenly dropped it. Since then they have contented themselves with threatening to sue our customers, but without bringing any suit. At last, however, probably finding that their plan could not be worked forever, they have entered suit against the Chicago & West Michigan road, which does not belong to the Western Railroad Association. Our attorneys are preparing for the defense of this suit. We welcome this opportunity to demonstrate the emptiness of the claim by the Consolidated Company that we were infringing the Sewall patent. The simple fact is that the Sewall patent is limited to a coupling having "a joint connection at the lower side of the meeting face of the body portion, upon which the two halves may be turned to disengage them," this language referring to the half hinges formed at the bottoms of the meeting faces of the Sewall coupler, and which are wholly absent in our universal coupling, there being not even a bearing portion on the faces of our coupler, which we cut away at the bottom so that there is not even the appearance of having anything resembling a hinge or joint or bearing. The Gold Universal Straight Port coupling is thoroughly protected by letters patent, and is the only coupling having a self-adjusting seat which takes up wear and avoids leakage. Companies purchasing from us will be defended and secured against losses or damages by reason of any claim for infringement of the Sewall patents or any other patents.

GOLD CAR-HEATING COMPANY.

Best and Second Best Block Signals.

NEW YORK, Jan. 21, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In connection with the D., L. & W. collision, it would be interesting to know whether the Hackensack drawbridge, as well as other points on the line requiring the best kind of signaling, is furnished with distant signals. The matter of distant signals seems so far to have been entirely overlooked in all of the various articles I have seen on the subject of this accident, and the argument made by D., L. & W. officials and others, who are apparently opposed to the use of block signals, that the block signal could not be seen in foggy weather until too late to make a stop, is sufficiently answered by saying that the presence of a distant signal gives an engineer ample time to make a stop in any kind of weather. It seems to me that no system of signaling can be considered complete without a proper arrangement of distant signals, and that for such lines as the Morris & Essex Division of the Lackawana, the New York Division of the Pennsylvania, and the Central of New Jersey, where the traffic is extremely dense, and of a mixed character, the system in use on the New York Central of having *advance* and *distant* signals, in addition to the home signals, is an absolute necessity for the safe working of the traffic of these lines.

I cannot understand why the Pennsylvania Railroad system of block signaling should be held up as an example to other lines, because, until the recent adoption of a track circuit system for a portion of the New York Division, none of the block station were provided with distant signals; and in addition to the fact that the system on that road is but a simple telegraphic one without interlocking, there is too much permissive working on certain parts of their lines for safety. This is a practice which a road claiming, as it does, the latest and best appliances for the public safety should never resort to. The Pennsylvania is certainly entitled to full credit for having introduced a block system at a time when such a system was almost unknown in this country, but even in this country the time has passed when a road, having the traffic on its lines which the Pennsylvania has, should be permitted to use a plain telegraphic block system without some one of the modern forms of interlocking between towers. The bad wrecks of heavy passenger trains at Latrobe, Steelton (two) and on the Meadows would undoubtedly never have occurred had the most approved form of interlocking block system been in use where these accidents occurred. So as far as the question of block signaling is concerned, instead of the Pennsylvania being a model for others to follow in this respect, the fact is that it is away behind the New York Central, the Erie, the New York, New Haven & Hartford and others. It certainly should not be said of an accident on such a road as the Pennsylvania that "the two collisions were due to the blunders of signalmen, who took it for granted that the block section was clear before the man at the outgoing end had signaled to that effect. In each case it was a mistake of one individual."

This is quoted from your editorial of Jan. 26. It is probably already being used by those in the D., L. & W. management, who oppose the block system, with telling effect on the innocent directors and others who are not familiar with the latest practice in block signaling.

E. S. C.

[Many railroad directors are, indeed, innocent enough to accept such a partial statement as that which our correspondent quotes; especially when a superintendent backs it up with the well-known implied claim that he—the superintendent—feels no compunctions, has allowed no laxity of discipline, and has performed the impossible feat of keeping the best men, at low wages; but from the generally intelligent tone of our correspondent's letter we suspect that *he* is not so innocent. He probably knows that that statement should not be used without also quoting the sixth paragraph of the same article: "Any road aiming to perfect its methods is bound to heed these lessons of experience"—the lessons that electric locks or better discipline or more intelligent experience must be employed, in order to secure the highest safety. The question of distant signals was secondary, in the case referred to. The main point was that there was no fixed signal at all. But it appears that this question is now settled, the Lackawanna road having announced that it will adopt the block system; and we are glad to print our correspondent's clear statement of sound doctrine on the subject of distant signals; though it must be very familiar to readers of the *Railroad Gazette*.—EDITOR.]

Massachusetts Railroad Commissioners' Report.

The Railroad Commissioners of Massachusetts, John E. Sanford, Everett A. Stevens and William J. Dale, Jr., have issued the 25th annual report of the board. The statistics are for the year ending June 30. Fifty-one corporations now make returns, but only 15 of these actually operate roads. The length of road in the state is 2,119 miles, the addition during the year being 26 miles and the decrease by remeasurements, etc, 1½ miles. There has been laid during the year 28 miles of second main track, four miles of third main track and three miles of fourth. Of the 2,119 miles of road in Massachusetts over 93 per cent. is operated by the five principal companies. The companies reporting operate 4,328 miles, so that all the statistics include more mileage outside of Massachusetts than within, but it is estimated that 80 per cent. of the business of these companies is done within the territory of Massachusetts. The cost of road and equipment of these companies is $82,080 a mile for standard gage and $39,608 for narrow gage, of which there is 63 miles, including 47 miles in Massachusetts.

The report devotes several pages to the density of railroad traffic in Massachusetts and its effect on rates. A little over 50 per cent. of the income of the roads reporting is from passengers, while in the Middle States only 28½ per cent., and in the United States as a whole 30⅛ per cent., of the income of the railroads is derived from this source. The Old Colony derives 62 per cent. of its revenue from passengers, and the Fitchburg 32 per cent. The average passenger fare per mile in Massachusetts is 1.83 cents, and the reduction has been very slight for eight years past. The average rate per ton per mile is 1.39 cents, a gradual reduction from 1.84 in 1880, 1.59 in 1885 and 1.45 in 1890. Comparing these averages with those of other parts of the United States (the average passenger fare in Massachusetts being the lowest in the country, and the average freight rate the highest, except for the thinly populated portions of New England, and the average freight rate in Ohio, Indiana and Michigan being .69 cent, less than one-half of the rate in Massachusetts), the Commissioners go on to argue that the need of better and cheaper freight facilities is now the most important problem for the roads of Massachusetts to settle. The fact that density of traffic and the length of haul are important elements is not lost sight of, but, after allowing for all these, it is still held that the need in Massachusetts for cheaper facilities is imperative and far reaching.

A chapter is devoted to the lease of the Old Colony to the New York, New Haven & Hartford. It appears that only about 39 per cent. of the Old Colony stock has been exchanged for New York, New Haven & Hartford stock and that the time fixed in the agreement for making the exchange has now expired. "So far as now appears it will not be for the interest of the New York, New Haven & Hartford to extend or renew the offer of exchange unless and until the dividends on its own shares shall have been reduced to less than eight per cent."

The lease of the Connecticut River road to the Boston & Maine is discussed and sharply criticised. The rental, 10 per cent. on the stock for 100 years, is characterized as excessive, especially as the surplus of the road, $1,290,000, was given outright to the stockholders as a dividend just before the transfer. And this dividend was not paid by the usual stock-watering process, but by the issue of 4 per cent. bonds which are likely to be a perpetual lien on the property. "It goes without saying that the issue of bonds to pay a stockholder's dividend is contrary to good practice and to sound principles." The Connecticut River stockholders have received liberal dividends for 30 years, earned by charging rates higher than other Massachusetts roads; but the fixed charges under the lease are more than would have been provided for by the actual net earnings for several years past. The report continues:

> The surplus of the company prior to the issue of the dividend bonds was the accumulation of overpayments by the public in excess of the cost of transportation and in excess of the ample returns which the stockholders had received from year to year on their interested capital. This surplus clearly belonged to, or was held in trust for, the public rather than the stockholders of the company. The immediate effect of the creation of the bonded debt of $1,290,000 in payment of the 50 per cent. dividend was to change the surplus of the company,—$1,000,000—into a deficit of about $250,000, and thus to cause a serious impairment of the capital stock. In this despoiled condition, stripped of its entire surplus, and with one-tenth of its capital wiped out, the road passed, a costly trophy, into the hands of the lessee. The division of more than a third part of the entire net assets of the lessor company among its stockholders on the eve of the lease, was a gross perversion of the trusts on which its franchises and property were held, and would have been a gross fraud upon the lessee if done without the full knowledge and consent of the latter. The assumption by the lessee company of an obligation to pay a perpetual dividend rental equivalent to 12 per cent. on the entire capital stock of the lessor, in the then denuded condition of the latter company—a burden which could be carried, if at all, only by shifting it upon the public by the exaction of excessive charges for transportation—was wholly unjustifiable both from a business standpoint and as against public policy. Taken as a whole, and regarded in any light, it is safe to say that no more unconscionable transaction has occurred in the railroad history of the state.

A full report is given of the interchangeable mileage ticket law passed in 1892 and the decision of the court holding it unconstitutional.

The detailed figures concerning accidents are in the appendix, which has not yet appeared, but there is a chapter giving the principal totals, from which we extract the following:

CASUALTIES.

In train accidents:	Killed.	Injured.
Passengers	10	30
Employees	4	36
From other causes:		
Passengers	15	127
Employees: Coupling	18	394
" Falling from cars, etc	42	143
" Overhead obstructions	10	34
" Various	36	207
Persons at protected crossings	20	12
" unprotected "	16	28
" stations	10	13
Trespassers	141	105

The national coupler and brake law is quoted and is regarded as an important step in the right direction, though it is "less specific and stringent than had been hoped." In view of the passage of this law the Commissioners recommend the repeal of the Massachusetts laws of 1884 and 1886, which required safety couplers and directed the Commissioners to hold biennial examinations of couplers. The law of Massachusetts requiring frogs, guard rails, etc., to be blocked is found defective in that it does not require the *maintenance* of the blocks, and its amendment is recommended.

A collision having occurred on the Old Colony road in consequence of the ineffectiveness of a brakeman's signal at night, the use of red lanterns is discussed at length. It appears that in the case cited the brakeman swung a red light and a white light together, and the engineman, not stopping soon enough, claims that he did not see the red light in season. The Commissioners discuss the relative distances at which red and white lights can be seen when held together or a few feet

apart. But their conclusion is only what might have been expected; to wit, that the rule (now in force on the Boston & Maine) should be made general that "flagmen at night must take with them one red and one white light, and when swinging the red light to stop a train must keep the white one concealed from view." It was suggested to the Commissioners that the brakeman should not take a white light, but the fact that a red lantern does not give sufficient light to walk by was finally admitted. It is well that the Commissioners have emphasized the rule referred to, and it may be noted incidentally that the Fitchburg road on adopting the standard code omitted the paragraph about concealing a white light when swinging the red one. But one naturally wonders, after all, whether all this has any bearing on the Old Colony collision; for it is not denied that the brakeman swung his lantern or lanterns, and that is a positive signal for an engineman to stop, without regard to the color of the light.

The total estimated cost of the abolition of grade crossings, under the provisions of the law of 1890, in all the cases in which the special commissions appointed by the Superior Court have made reports, now stands as follows for the several years since the passage of the act:

For the year ending June 30, 1891.....	$379,959	
Commonwealth's proportion*.....		$94,990
For the year ending June 30, 1892.....	278,874	
Commonwealth's proportion.....		69,718
For the year ending June 30, 1893.....	1,045,150	
Commonwealth's proportion.....		261,287
For the six months ending Dec. 31, 1893....	394,762	
Commonwealth's proportion.....		98,691
Totals.....	$2,098,745	$524,686

*Twenty-five per cent. of the whole cost.

It is provided in section 10, that "The amount to be paid by the Commonwealth in any one year shall not exceed $500,000; and the total amount to be paid by the Commonwealth under the provisions of this act shall not exceed $5,000,000." This clause is not to be construed as a specific appropriation of $500,000 for each of the 10 years next succeeding the passage of the act, so that, if less than $500,000 should be expended in any such year, the unexpended balance for that year would lapse and be no longer available for the purposes of the act. Subject only to the limitation that no more than $500,000 shall be paid by the Commonwealth in any one year, the total appropriation of $5,000,000 is good for an unlimited number of years, until exhausted.

The most extensive undertaking for the separation of grades now in contemplation is that on the Boston & Providence, between Chester Park and Blakemore street in Boston, for which by a special law the state pays a larger share [35 per cent.], but the amount in this case does not count as a part of the $500,000 to be paid in any one year, or as a part of the $5,000,000 to be paid in the whole, as above specified.

The point has not yet been reached, nor as yet approached, where there need be apprehension lest the provision made by the Commonwealth will fail to cover present and future works of this character.

The usual statistics of traffic and operation are given. The report embraces the special report of Prof. George F. Swain on Bridges, which we shall give in a future issue.

Coaling Station of the Manhattan Elevated.

Herewith are given illustrations of the Manhattan Elevated Railroad Company's terminal station at 129th street, New York City, which is also the location of the coaling station of the Eastern Division of the road, comprising the Second and Third avenue lines and the Suburban branch. In the operation of elevated railroads with train intervals of but 1¼ minutes, the problem of providing proper facilities for locomotives, to dispose of their ashes, sparks and drips, to clean their fires and to take on fresh supplies of coal, water, oil, etc., becomes important. The cuts represent the leading features of a modern coal and water station. The plant is located at tidewater, and at a common junction of the three lines which it is to accommodate. The concentration of the work at this point dispenses with three inferior plants.

Fig. 1 shows the general plan of the coaling station and its adjuncts with the buildings and features named and explained. The yard occupies the entire space between Second and Third avenues and between 128th and 129th streets. The most interesting features of the station are the devices for handling coal and delivering it to the locomotive tenders and the operating steam plant, designed by Mr. Lincoln Moss, C. E., Principal Assistant Engineer of the company, and which was erected under his supervision. The locomotives of this division require about 2,000 tons of coal a week and the entire road about 200,000 tons a year.

Fig. 2 shows the wharf at which the coal is delivered from the barges. These barges deliver from 400 to 700 tons of Lehigh broken anthracite each. The coal is elevated by a Hunt automatic steam shovel of one ton capacity and the daily discharge is about 250 tons. The shovel can, in case of emergency, discharge 60 tons an hour on a full cargo. This shovel is shown in fig. 6, and is operated "by means of a chain which embraces a sprocket pulley on the shovel and terminates in a bob at the arm weighing about 800 lbs., which on being released takes up enough slack in the chain to close the shovel when the hoisting engine is started. In the process of hauling in the slack of the chain the bob returns and the jaws of the shovel are drawn together inclosing a ton of coal. The shovel is then lifted and ascends the incline until it is brought over the hopper, when a trip unlocks the jaws and the load falls into the hopper, from which it is drawn into the transfer cars and the shovel immediately returns for another load." The wharf being a little longer than the barges, it became necessary to mount the steam shovel, engine and hopper on a traveling steel crane, which travels on a gallery parallel to the wharf and 100 ft. long, fully shown in fig. 2. The coal is received from the hoppers into one-ton push cars, running on a Hunt narrow-gage track. They are weighed and dumped into the storage pockets directly over the tracks. The capacity of the plant is such that all the hoisting of coal is done between 7 a. m. and 5:30 p. m., and for the following 13½ of 24 hours but one man is required to operate the entire plant, his duties being to feed the dumping chute from the overhead storage supply.

A factor of great importance in these stations is that when once put into service they can never be allowed to stop their supply of coal without stopping traffic. To meet this emergency there are four reserved double bucket elevators for hoisting coal from the reserved stock on the ground. The shovel engine takes steam from one of two duplicate mains having branches with ball joints and quick-closing special elbows.

Fig. 3 shows a view of the coaling bridge as seen from the Harlem River Bridge shown in fig. 1. Fig. 4 shows a coaling chute, with a locomotive receiving its charge of coal. Ten locomotives can be accommodated at one time, and while the engineman oils and inspects his engine the fireman cleans his fire, trips the automatic coal hopper, which delivers 560 lbs. of coal into the tender, and fills his water tank through a 4½-in. hose. At the same time the "pan pullers" clean the ash pans and spark chambers, inspect and wipe the engine and provide other small supplies before the engine goes out on the relay track for its next trip. Each charge of coal is weighed into the dumping hopper which hangs from a scale beam. The charges are uniformly one-quarter of a long ton in order to simplify the accounts. An attendant opens a gate from the main storage supply of 250 tons above the tracks and closes the gates when the automatic hoppers have received their charge. As the locomotives come in for fuel and water the fires are raked and the ashes dumped into flues leading into fireproof chambers beneath, from which they are carted away. The locomotives of the Second avenue and Suburban lines are coaled from the south end of the station and the arrangements are similar to those provided for the Third avenue lines. The coal for the storage bunkers on the Second avenue line is trans-

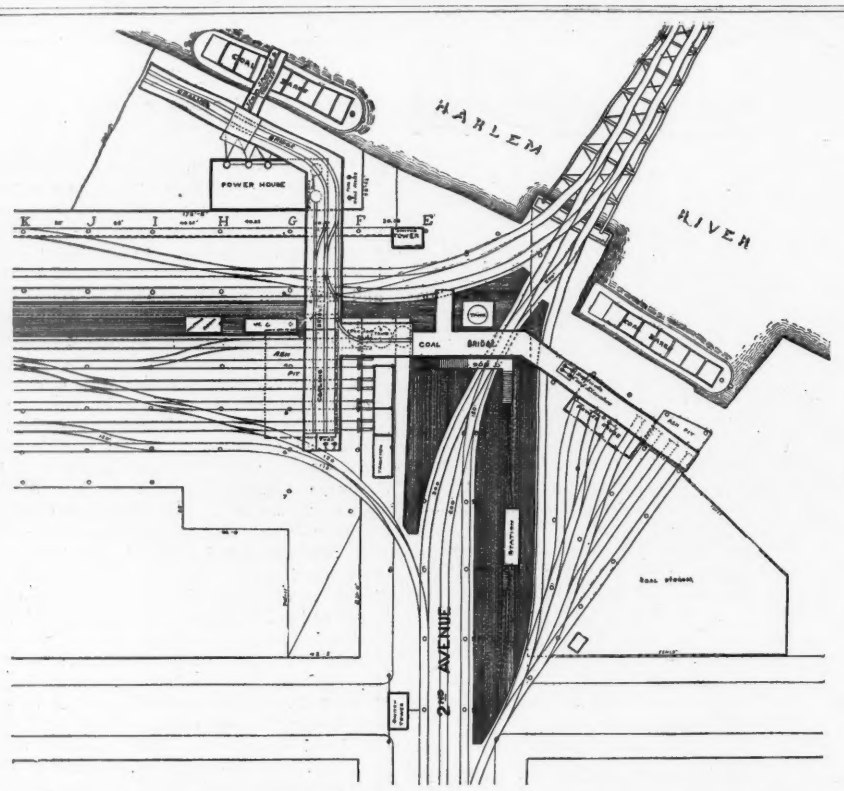


Fig. 1.—Plan of Tracks—Manhattan Railway Coaling Station, 129th Street, New York City.

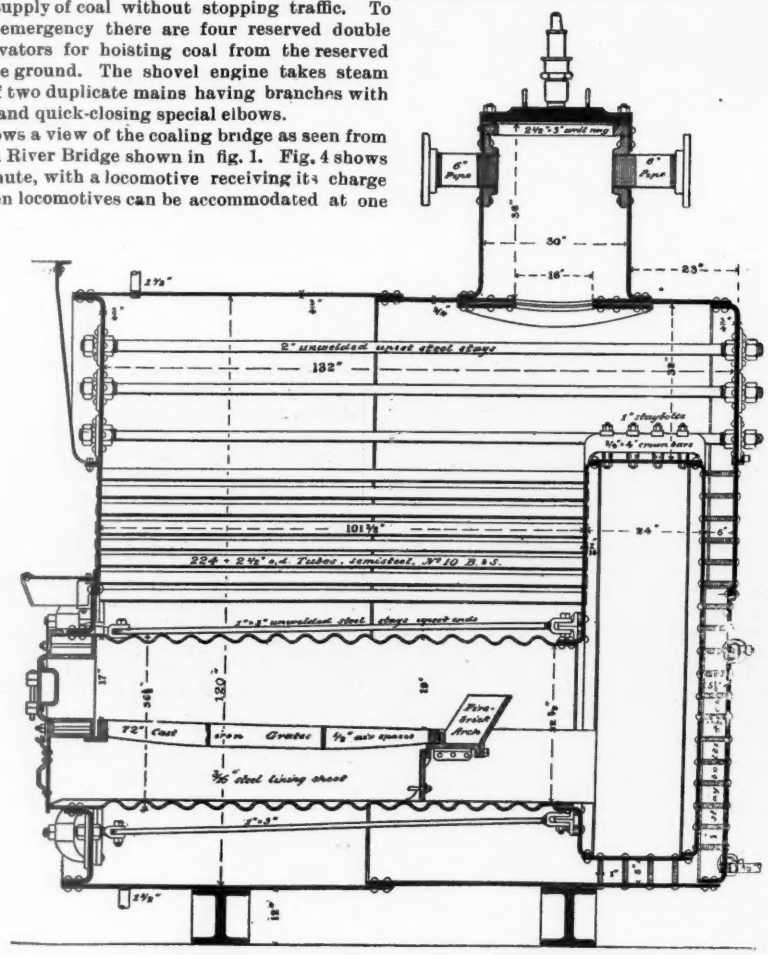


Fig. 5.—Section of Boiler for Manhattan Railway Coaling Station.

ferred from the barges by means of gib hoist and dumping buckets and an overhead single-rail circular track, upon which runs a two-wheel trolley hoist, to which the loaded buckets are hooked and pushed by hand to any point of the bunkers.

The railroad's waterworks at this plant distribute almost 400,000 gallons of water daily, through two 10-in. mains, leading from steel (duplicate) pressure tanks, air cushioned. Whenever the pressure falls too low, it is supplemented by one of two Knowles pumps, duplex compound surface condensing, controlled by Curtis regulators. The range of pressures is from 40 to 150 lbs. per sq in. the latter pressure being for fire service. These pumps can each throw 3,000 gallons, per minute and draw from overhead storage tanks. All steam and water pipes are duplicated, a principle which is adhered to throughout, so that a shut down or crippling of the service is practically impossible. The three boilers are piped independently and one is always in reserve in warm weather; two are out of service. Each boiler is fed independently at two points and the piping is so arranged that feed may be delivered into any boiler through either inlet by the hot return pump from one of the two regular hot well marine feed pumps, or by any of the injectors. These plants demand a type of boiler shown on fig. 5, which must be very compact and thoroughly accessible inside and out, of large reserve power and steadiness; brickset boilers are objectionable in such plants, as they require too much space and consume too much time to cool off to make internal repairs. Three years ago a similar plant was designed and installed for the Western division consisting of a pair of 9 × 9 ft. Scotch marine boilers slightly modified from naval practice. Although in constant service since that time no repairs have been needed beyond new grate-bars and gasket rings for the manholes. They are remarkably steady, and furnish a steam so dry as not to be visible when the "pops" are lifted. Their evaporative efficiency per pound of Lehigh broken coal is 11.1, burning 15 lbs. per square foot of grate per hour. The unqualified success of this experimental pair determined the type of the boilers for this plant. They are each 10 ft. by 10 ft., and rate at 200 H. P. on the standard rating of 30 lbs. of water per horse power. The three manholes in each boiler are so arranged that the inspector may not only see but touch and examine all the flue surfaces above and below, and go in on top of the return tubes and uptake crown sheet. Each boiler, also, has five handholes. These boilers furnish steam heat for the drip-pans, water pipes and 11 terminal buildings and also run the various engines near this point, comprising the shovel engine, two dock engines, two steam winches, four elevator engines, two compressors and nine pumps.

The economy attained by the arrangement described is very substantial, the use of the steam shovel alone reducing the labor more than one-half. The location and general layout of the station are a tribute to the foresight and engineering skill of Col. F. K. Hain, Vice-President and Manager of the Manhattan road.

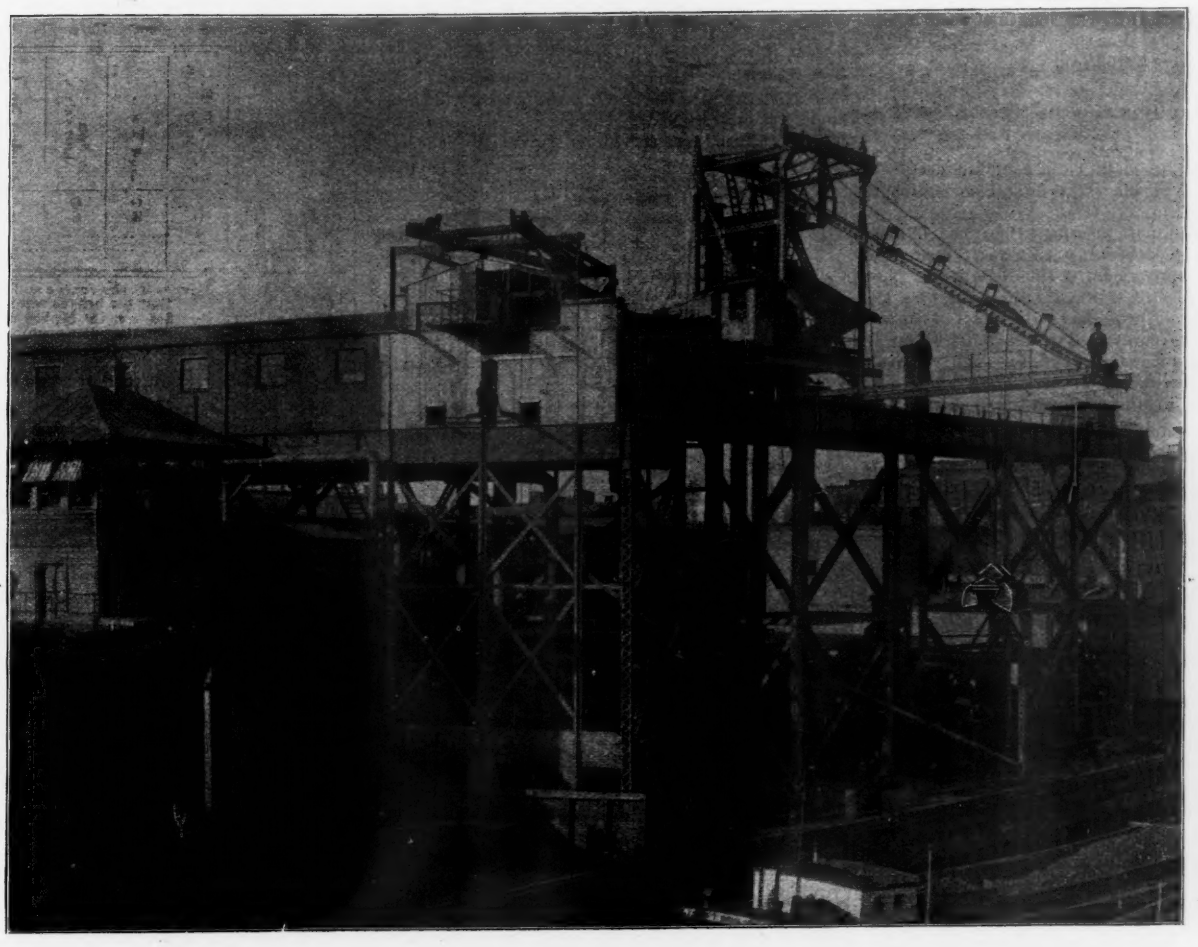


FIG. 2.—GENERAL VIEW—MANHATTAN COALING STATION.

Fig. 3.—Coaling Bridge.

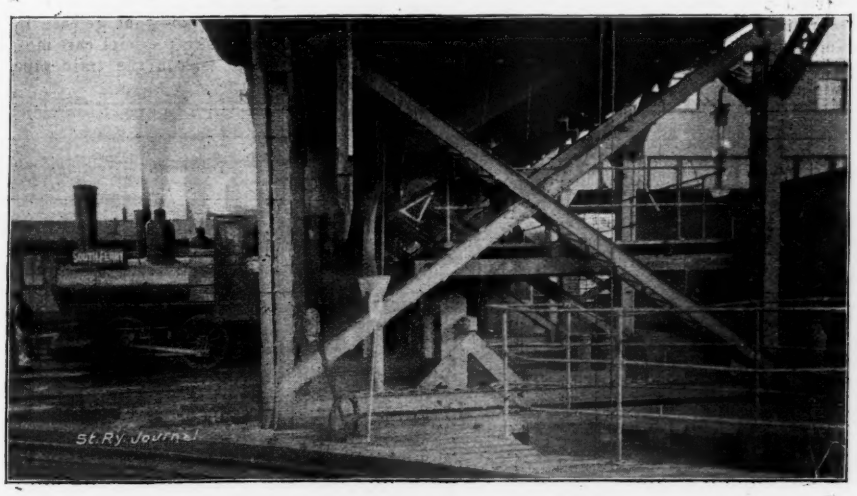


Fig. 4.—Chute for Coaling Locomotives.

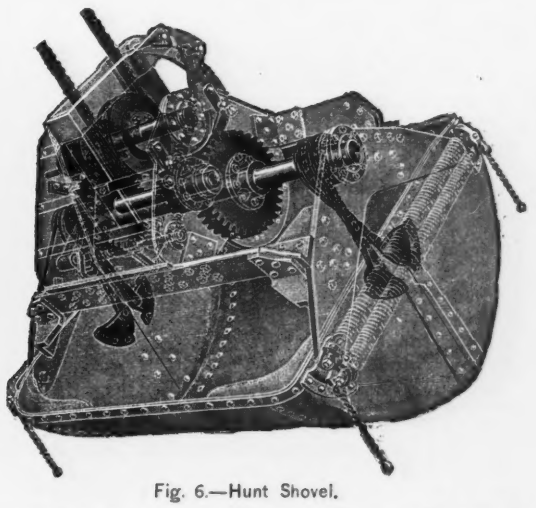


Fig. 6.—Hunt Shovel.

Connecticut Railroad Commissioners' Report.

The Railroad Commissioners of Connecticut, George M. Woodruff, William O. Seymour and Alexander C. Robertson, have issued the 41st annual report of the Commission. The year has been important as it includes the enlargement of the New York, New Haven & Hartford and the appointment of Receivers for the New York & New England and the Philadelphia, Reading & New England, but it is otherwise uneventful. Only 1⅝ miles of new road has been built. The question of grade crossings is discussed at length, especially as affected by the increase in electric street railroads, and the laxity of some past legislation is condemned. The Commissioners have granted applications for crossings contrary to their own convictions because legislation, as affected by judicial interpretations, seems to

require such action. It is suggested that the Commission should be more fully empowered to impose restrictions where necessary.

The railroads paid $746,041 in taxes to the state of Connecticut last year, being about 32 per cent. of all the taxes received by the state. The length of road in the state is now 1,013 miles. For the year ending June 30 last the accidents were as follows:

	Killed.	Injured.
Passengers	7	12
Employees	64	445
Trespassers	85	78
Others, non-trespassers	18	15
At highway crossings	16	15

The number of trainmen killed in coupling accidents was 6, and of injured 197. By falling from trains 20 were killed and 74 injured.

The Board has had more meetings than usual, most of them having been concerning crossings, etc., in connection with the improvement of the New York, New Haven & Hartford. Orders have been made for the elimination of 35 grade crossings. By an act of the last legislature the state reimbursed towns and cities for all expenses incurred since May 1, 1885, for such removals of grade crossings as have been carried out under proceedings instituted by the railroad companies. Nine towns have already applied for money under this act and $26,000 has been paid. At Water street, New Haven, a dangerous place on the New York, New Haven & Hartford the Commissioners have ordered that two crossings be eliminated before 1896, assessing one-fourth of the expense upon the state and three-fourths upon the road. The Commissioners do this on their own motion, neither the city nor the company having taken any action. The New York, New Haven & Hartford has been authorized to abolish the use of cattle guards at 15 places where it appeared that their presence in the track would increase rather than diminish danger.

A law was passed last year under which the Railroad Commissioners may authorize a railroad company, where safety so requires, to condemn any private crossing, paying for the rights, easements, etc., the same as in the cases where land is needed by a railroad. The railroads are reminded that they can now secure absolute freedom from this danger to their trains whenever they are willing to pay for it. The report discusses steel rails, metal ties and interchangeable mileage tickets. An appendix contains, besides the usual statistics, a reprint of the laws of the state relating to railroads.

Report of the Committee of the M. C. B. Association on the Air-Brake Tests Made at Altoona.

The Committee on Air-Brakes of the Master Car Builders' Association, the members of which Committee are G. W. Rhodes, E. B. Wall, Geo. Gibbs, A. S. Vogt and E. A. Williams, held a series of tests Nov. 13 to 18, inclusive, at the testing rack of the Pennsylvania Railroad at Altoona. The following brake companies participated in the tests: Lansberg, one set of 50 triples and same triples with alterations; Crane, one set of 50 triples; Westinghouse, two sets of 50 triples each; New York, one set of 50 triples; Boyden, two sets of 50 triples each. The triple valve of the New York Air Brake Co. was the 1893 valve, and not the valve previously made by the New York Co. It was the valve that had not been put in service so far as now known, and is not the valve that the New York Co. is now offering for sale. The objects of the tests and a synopsis of the results are given below, all figures given being the corrected ones.

M. C. B. No. 1. APPLICATION TEST (a).—Brakes must commence to apply on the fiftieth car in three seconds, or less than three seconds from the first movement of the engineer's valve handle, and must indicate at least 55 lbs. in the cylinder of the fiftieth car in 3½ seconds or less, from the first movement of the engineer's valve handle. This test will be made with: (1) 6-in. piston travel. (2) 12-in. piston travel. (3) 4-in. piston travel.

Results, Application Test A.

Name of Brake Co.	Number of trials averaged.	Travel in in.	Engineer valve to 1st cylinder. Seconds.	1st cylinder to 50th cylinder. Seconds.	55 lbs. in 50th cylinder. Seconds.	Total time. Seconds.	Max. Pressure. 50 cylinder	Max. Pressure. 50 reservoir.
			Ave.	Ave.	Ave.	Ave.	Ave.	Ave.
Crane	4	4	.155	2.955	.475	3.585	.....	.....
Westinghouse M. C. B.	3	4	.126	2.386	.446E	2.956	67.00	71.00
Westinghouse Wilmerding	3	4	.123	2.406	.400	2.93	61.00	70.50
New York	3	4	.126	2.303	.543	2.973	62.50	70.33
Boyden No. 1.	3	4	.143	2.656	.463	3.266	61.50	70.33
Boyden No. 2, slide	4	4	.142	2.750	.42	3.310	60.50	71.75
Lansberg	4	4	.12	2.695	.510C	3.240C	61.00	70.50
Crane	3	6	.156	2.913	.936	4.016	.....	.....
Westinghouse M. C. B.	3	6	.133	2.20	.753	3.086	59.166	71.00
Westinghouse Wilmerding	3	6	.113	2.360	.546	3.02	59.50	70.83
New York	3	6	.140	2.21	.89	3.240	61.00	70.50
Boyden No. 1.	3	6	.130	2.690	.560	3.380	59.50	70.33
Boyden No. 2, slide	3	6	.140	2.553	.773	3.466	59.00	70.33
Lansberg	4	6	.137	3.445	.59D	3.44D	52.27	70.12
Crane	3	12	.17	3.153	2.313	5.636	.....	.....
Westinghouse M. C. B.	4	12	.120	2.59F	1.02	3.725	52.500	70.87
Westinghouse Wilmerding	3	12	.113	2.566	0G	0G	51.66	70.50
New York	3	12	.126	2.46	1.83	4.416	55.166	70.50
Boyden No. 1.	3	12	.133	2.766	A	.....	52.166	70.50
Boyden, No. 2, slide	3	12	.136	2.853	1.385B	4.380B	52.00	70.33
Lansberg	4	12	.130	2.800	1.395D	4.33D	52.50	70.66

Note A.—Pressure in 50th cylinder in one trial did not reach 53 lbs.

Note B.—Contact on 50th cylinder in one trial was not broken.

Note C.—Indicator cut out in one test.

Note D. Pressure in 50th cylinder in one trial did not reach 53 lbs. and contact was not broken.

Note E.—Pressure in 50th cylinder in one trial did not reach 53 lbs.

Note F.—Pressure in 50th cylinder in two trials did not reach 53 lbs.

Note G.—Pressure in 50th cylinder did not reach 53 lbs.

M. C. B. No. 2. APPLICATION TEST (b).—Commencing with the fifth car from the engine, the brakes of three successive cars will be cut out; the brakes will then be applied as per test No. 1. The emergency action should pass these three cars and apply on the fifth car in the same time as in test No. 1. Tests made with piston travel of 4 in.

Results, averaged.

Name.	No of cylinders cut out.	1st cylinder, seconds.	50th cylinder, seconds.	55 lbs. in 50th cylinder, secs.	Total time, seconds.	Max. pressure. 50 cyl'dr.	Max. pressure. 50 res'v'r.	See note.
Crane	2-once 3-five times	.172	3.173	.686	3.866	.....	.....	
West'hous M. C. B.	2-twice 3-five times	.132	2.820	.392	3.530	55.20	70.29	B.
West'hous Wilmrd'g	2-once 3-five times	.120	2.398	.420	2.897	60.66	70 50	
New York.	2-twice 3-five times	.142	3.155	.574	3.667	52.971	70.50	C.
Boyden No. 1	1-twice 2-five times 3-four t'ms	.130	.3974	.438	4.270	46.80	70 59	D.
Boyden No. 2 (slide)	2-three t'ms 3-five times	.133	.3565	.442	3.31	57.028	70.42	E.
Lansberg	1-five times 2-three t'ms	.133	.5191	42.00	3.186	41.22	70.50	F. & G.

Note B.—No emergency, twice when 3 were cut out.

Note C.—No emergency took place and brakes were released before pressure equalized in the 50th cylinder, twice when 3 were cut out.

Note D.—Pressure in 50th cylinder and reservoir did not equalize because brakes were released where it was seen that emergency had failed twice with 2 cut out and three times with 3 cut out.

Note E.—Brakes were released before pressures in 50th cylinder and reservoir had equalized, three times with 3 cut out.

Note F.—Pressure in 50th cylinder did not reach 53 lbs.; and contact was not broken three times with 1 cut out; three times with 2 cut out.

Note G.—Emergency, twice with 1 cut out.

M. C. B. No. 3. GRADUATING TEST.—Seventy pounds train-pipe pressure having been secured, the following tests will be made: (a) A reduction of 8 lbs. in train-pipe pressure. This should lightly apply the 50 brakes. (b) a further reduction of 4 to 6 lbs. This should increase the braking power on all the brakes. (c) A reduction to 30 lbs. should equalize the pressure between the auxiliary reservoirs and brake cylinders. The piston travel in this test will be 6 in.

Results Averaged.

Name.	Pounds, reduction.	1st cylind'r, pounds.	25th cylind'r, pounds.	50th cylind'r, pounds.
Crane	8	16.16	12.96	13.36
Westinghouse M. C. B.	8	16.40	15.26	12.25
" Wilmerding	8	15.30	12.13	9.16
New York	8	17.13	11.96	11.50
Boyden, No. 1	8	12.03	12.73	9.00
" No. 2 (slide)	8	16.16	15.46	11.23
Lansberg	8	9.60	A	11.33
Crane	14	40.70	41.93	32.86
Westinghouse M. C. B.	14	38.66	37.36	36.23
" Wilmerding.	14	38.50	35.23	36.96
New York	14	39.63	37.13	33.96
Boyden No. 1	14	36.06	34.76	29.83
" No. 2 (slide)	14	42.73	42.26	38.13
Lansberg	14	26.73	4.50	36.30
Crane	30	50.70	52.50	52.00
Westinghouse M. C. B.	30	50.70	53.16	52.00
" Wilmerding.	30	50 46	53.16	49.30
New York	30	50.93	53.66	49 80
Boyden No. 1	30	50.70	53.50	50.33
" No. 2 (slide).	30	52.10	54.16	51.83
Lansberg	30	47.93	16.56	50.83

NOTE A.—No movement of piston.

M. C. B. No. 4. DISC TEST.—Test to determine the sensitiveness of the emergency valve. Three valves selected at random will be taken for this test and each tried separately. The engine and tender brake should be connected in. A train-pipe pressure of 70 lbs., having been secured, the air will be discharged as rapidly as it may through an opening in the engineer's valve of 10-64 in. diameter. Under this condition the emergency action must not take place.

M. C. B. No. 4½ DISC TEST.—Test is to determine the point at which the emergency feature commences and is complete. One valve taken for this test and engine and tender brake connected in.

Conditions to be the same as in test No. 4.

Sensitiveness of Service Valve Disc Test No. 4½.

Diameter of disc opening.	Crane.	M. C. B. Westinghouse.	New York.	Boyden slide valve.	Boyden No. 1.	Lansberg.	Westingho use
1-64	.....	.....	O	O	O	O	O
2-64	O	O	S	S	S	S	.....
3-64	S	S	.....	.....	.....	.....	.....
4-64	.....	.....	.....	.....	.....	.....	.....

NOTE.—In the above tests the engine and tender brakes were cut out. "S" signifies that the brakes went on under service conditions. "O" signifies that the brakes would not go on.

This table shows the smallest disc opening to apply the service feature of each triple.

M. C. B. No. 5.—Test to determine the holding power of the brake in service application and emergency application.

(a) Service Application.—Gages will be placed on the cylinder and auxiliary reservoir of the first twenty-fifth and fiftieth car with 70-lb. train pipe pressure; brakes will be applied by admitting, as nearly as may be, 15 lbs. into the cylinder of the first car. Record of pressure in the auxiliary reservoirs and cylinders will then be taken as follows: (1) At the first application. (2) In five minutes from first application. (3) In 10 minutes from first application. (4) In 15 minutes from first application.

(b) Emergency Application.—This will be the same as above, except that all the air will be exhausted from the train pipe.

Results of Test No. 5.

	Service. Pressure in 1st cylinder.	Service. Pressure in 25th cylinder.	Service. Pressure in 50th cylinder.	Emergency. Pressure in 1st cylinder.	Emergency. Pressure in 25th cylinder.	Emergency. Pressure in 50th cylinder.
At start:	Lbs	Lbs	Lbs	Lbs	Lbs	Lbs
Crane	11.5	20.5	....	61.0	63.0	60.0
Westinghouse M. C. B.	14 6	13.2	19.0	60 0	62.0	59.5
" Wilmerding	13.1	12.5	9.0	60.0	60 0	58.0
New York	14.6	15.0	7.0	62.5	65.0	61.0
Boyden No. 1	16.4	14.5	11.8	61.0	62.0	60.0
" No. 2 (slide)	14 6	13.6	8.0	61.0	63.0	60.5
Lansberg	20.0	....	30.5	57.0	60.0	60.0
Five minutes:						
Crane	30.0	25.0	20.0	49.1	57.8	55.0
Westinghouse M. C. B.	20.0	12.5	14.5	46.5	56.1	55.5
" Wilmerding	21.8	15.4	18 2	52.1	42.1	56.0
New York	22.7	17.7	13.6	53.1	58.9	58.0
Boyden No 1	32.2	33.3	45.9	55.5	57.8	56.5
" No. 2 (slide)	29.5	15.0	13.6	53 6	58.9	56.0
Lansberg	14.2	.	25.7	51.3	37.1	53.5
Ten minutes:						
Crane	34.5	36.2	27.3	39.4	52.5	51.0
Westinghouse M. C. B	23.2	10.9	18.2	36.6	49.5	51.0
" Wilmerding	28.2	16.4	25.7	44.3	31.0	53.0
New York	25.9	19.5	13.6	43.5	54.5	55.5
Boyden No 1	35.6	35.7	50.5	50 7	52 5	53.0
" No. 2 (slide)	36.1	15.4	18.9	48.7	55.0	51.0
Lansberg	12.3	....	22.6	49.5	27.5	48.6
Fifteen minutes:						
Crane	27.7	28.5	28.4	32.2	47.4	46.4
Westinghouse M. C. B	23.6	10.5	20.0	29 5	44.7	47.7
" Wilmerding	36.1	17.7	31.6	38.3	22.5	50.0
New York	24.5	19.5	13.6	37.2	49.5	51.5
Boyden No. 1	35.6	35.2	49.1	46.1	47.4	50.0
" No. 2 (slide)	37.2	15.4	22.1	42.6	50.5	47.3
Lansberg	10 0	....	18.9	45.2	19.5	44.5

M. C. B. No. 6. RELEASE TEST.—The following conditions should be observed in this test: (a) Boiler pressure, 160 lbs.; (b) Main reservoir cut out; (c) Pumps, 8-in. steam cylinder, 7½-in. air cylinder.

A uniform pressure of 70 lbs. having been secured in the train pipe, all the air will be exhausted by an emergency application. A pressure of 90 lbs. will then be maintained against a diaphragm perforated by a 3-32-in. hole, and a record taken of all brakes that release inside 30 minutes. In making this test special care must be taken to see that there is no leak in the train pipe. Piston travel, 6 in.

Results, Test No. 4.

	Crane. Triple. A	Crane. Triple. B	Crane. Triple. C	M. C. B. Westinghouse. No. 1 Triple.	M. C. B. Westinghouse. No. 8 Triple.	New York. No. 7 Triple.	New York. No. 23 Triple.	Boyden slide valve. No. 7 Triple.	Boyden slide valve. No. 21 Triple.	Boyden No. 1. No. 1 Triple.	Boyden No. 1. No. 37 Triple.	Lansberg. No. 1 Triple.	Lansberg. No. 13 Triple.	Westinghouse. No. 1 Triple.	Westinghouse. No. 22 Triple.
9-64	S	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10-64	FE	S	.....	.....	S	.....	.....	.....	.....	S	S	.....	.....	.....	S
11-64	.....	S	S	S	PE	S	S	.....	.....	PE	PE	.....	.....	S	PE
12-64	.....	S	FE	PE	PE	PE	PE	S	.....	FE	PE	.....	.....	PE	PE
13 64	.....	S	.....	FE	FE	PE	PE	FE	S	.....	PE	.....	.....	PE	FE
14-64	.....	S	.....	.....	.....	FE	FE	.....	FE	.....	FE	.....	.....	FE	.....
15-64	.....	S	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
16-64	.....	S	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
17-64	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18-64	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
19-64	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	S	.....	.....	.....
20-64	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	PE	S	.....	.....
No disc.	.....	FE	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

"S" signifies "service." PE "partial emergency." FE "full emergency."

In the above tests the engine and tank brakes were cut in.

NOTE 1.—On taking apart Crane triple "B" the rubber seat of emergency valve was found displaced. On being pressed into place and re-tested it gave service with 10-64 disc and full emergency with 11-64 disc.

NOTE 2.—The exact opening of the Lansberg brake to obtain full emergency was not determined, as the largest disc the committee had was with 20-64 opening.

This table in addition to giving the results of Test 4 shows the opening at which the emergency commences and is complete with each triple.

Results of Release Test No. 6.

Name.	Number released. 0 to 5 min.	5 to 10 min.	10 to 15 min.	15 to 20 min.	Total released at end of 30 min.	No. not released after 30 min.	See note.
Crane	12	20	16	2	50	0	A
Westinghouse M. C. B.	3	18	18	1	40	10	....
Westinghouse Wilmerding	0	14	33	0	47	3	B
New York	0	7	41	0	48	2	C
Boyden No. 1	1	9	19	9	38	12	....
Boyden No. 2 (slide)	1	9	17	2	30	20	....
Lansberg	0	16	2	0	18	.....	D

Note A.—All released at end of 19½ min.
Note B.—Two of last three released by tapping triple with hammer.
Note C.—One of last two were released by tapping valve with hammer.
Note D.—32 were not released after 15 minutes; four of these showed that pressure was reduced, but piston did not release.

M. C. B. No. 7. TEST TO DETERMINE THE TIME OF CHARGING ONE AUXILIARY RESERVOIR.

(*a*) Cut out the brake to be tested by the cut-out cock. (*b*) Bleed the auxiliary reservoir, empty and close the bleed cock. (*c*) Secure 90 lbs. pressure on main air reservoir and train pipe. (*d*) Shut off the pump. (*e*) Cut in the brake to be tested and note from the reading of the gage, time occupied in charging 70 lbs. The time should not exceed 60 seconds nor be less than 45 seconds.

Results of Test No. 7.

Name.	Triple charged.	Time of charging sections.
Crane	.....	54
Westinghouse M. C. B.	.....	72
" Wilmerding	No. 1	87½
New York	.....	72-68½*
Boyden No. 1	No. 7	56
" No. 2 (slide)	No. 7	45½-45½
Lansberg	No. 1	6'½-65*

* More reliable figure.

TEST NO. 8.—SERVICE APPLICATION FOLLOWED BY EMERGENCY.

Name.	Number of trials.	First cylinder. Emergency times. Yes.	First cylinder. Emergency times. No.	25th cylinder. Emergency times. Yes.	25th cylinder. Emergency times. No	50th cylinder. Emergency times. Yes.	50th cylinder. Emergency times. No.
Crane	5	5	.....	.....	5	.....	5
Westinghouse M. C. B.	3	3	.....	2	1*	2	1
" Wilmerding	4	4	.....	2	2	2	2
New York	7	5	2	7	.....	7	.....
Boyden No. 1	4	4	.....	3	1	1	3
" No. 2 (slide)	4	4	.....	3	1	1	3
Lansberg	2	.....	2*	.....	2	.....	2

* One partial emergency.

Hyatt Roller Bearing.

Though the subject of roller bearing is somewhat trite, and all of the various devices have so far met a common fate, yet we venture to present the device shown in the accompanying engravings as having met some success. The perfection reached in ball bearings of a bicycle should demonstrate the practicability of a better form of bearings for machines and railroad rolling stock than is now employed. The cheapness and perfection arrived at in the manufacture of balls and rollers by the Symonds roller process remove any objection that may have existed to the use of such bearing on account of the cost of those parts.

One of the difficulties experienced in roller bearings is to keep them parallel to the axis of the journal, and without the use of a complicated device, and Mr. J. W. Hyatt claims to have met this difficulty by adopting a flexible roller, in the shape of a spiral spring made from mild steel strips or bars. A size found practicable for street car service is made from three-eighths by three-sixteenths steel bars rolled into a spring ¾ in. in diameter by 6 or 8 in. long, with a space betweeen the coils of ½ in., shown in fig. 1. The steel employed contains about one-tenth of one per cent. carbon. When solid cylindrical rollers are used they become slightly removed from a position parallel to an axle or shaft, and bind between the journal and box bearing at three points—one between the center of each roller and the shaft, two between the ends of the roller and the journal box. The binding and sticking materially increase the friction and wear. To avoid this binding of solid rollers clumsy devices have been used to bind them in a parallel position, which have caused considerable noise while running. It is claimed for the Hyatt roller bearings that they run smoothly and quietly, are shapely, require no complicated device to hold them in position, run with less friction than solid roller bearings, and are comparatively inexpensive to manufacture. They are said to be flexible and not to bind when out of parallel, for they can conform to the curve of the axle, and compress and expand so as to touch at many points. The vibrations also are absorbed by the coils and the noise reduced to a minimum. The limit of elasticity or lateral pressure at which one of these spring rollers takes a permanent set is 16,000 lbs. When placed in a journal the rollers run between two sleeves, fig. 2, *e* and *e*, one sleeve fitting closely to the axle and the other to the inside of the journal box. These sleeves when worn out can be replaced. A yoke shown at *g* keeps two opposite rollers parallel, which keep all the others in position.

By means of an apparatus shown in figs. 2 and 3, comparative tests have been made with different bearing to demonstrate the superiority of the Hyatt bearing. *A* is a journal box showing the position of the Hyatt roller bearings; *g g* are two narrow plates joined to a collar around the shaft to keep two opposite bearings in a parallel position; *t t t* are the spring bearings; *e e* are the two sleeves. The plates *g g* are not necessary, as without them the bearings will run. *XX* is the side elevation of two journals, which hold up the shaft *S*, and are provided with roller bearings. The journal rests upon an iron plate *D*, which acts as a short piston. A section of this is partly shown to the right of fig. 2. The letter *f* marks a diaphragm of rubber with some form of packing on top. Under this diaphragm is a thin layer of glycerine, with a surface of 100 sq. in. From the glycerine, a pipe, *P*, filled also with the liquid, runs to an ordinary steam gage, *G*. One ton pressure upon *D* shows 20 lbs. on the gage. Pressure is applied by the means of screwbolts *C C*, which run from the supporting journals down through plates *L*, which are placed upon the supporting plate, shown in the side elevation. *P'* is a pulley on the shaft *S*, from which a belt runs up over the two idlers, *N* and *N'*, and then down verticaliy under the driving pulley *M*. The two pulleys, *N* and *N'*, are connected by the lever *H*, pivoted upon the knife edge *K*, which is supported by the bracket *B*. This leaves *N* and *N'* free to move about the center *K*. From the right-hand end of the lever, a wire runs down to a spring gage (not shown). The reading of this gage is added to weights, which are hung upon the wire. The horse power is calculated by the formula $HP = 2\pi n R E$ divided by 33000. In which *R* is the radius of the pulley *P*, *E* the difference between the pulls at *R* and *R'*, and *n* is the number of revolutions per minute.

A journal, containing Hyatt roller bearings, was first set upon the shaft, and the pressure noted. Afterwards this journal was replaced by a standard P. R. R. journal, and the pressures and temperature compared with the first. Some of the results of the tests are as follows.

	Condition.	Pressure in tons.	Reading of balance.	Revolution per minute.	Less ⅝ lbs. for supporting journals.	Diameter of pulley.	HP.
Test of Hyatt bearings.	Moving.	4	14 lbs.	395	10½ lbs.	12 in.	0.40
	At start.	4	16 lbs.	395	12½ lbs.	12 in.	0.46
Test of P. R. R. journals.	Moving..	4	20 lbs for 10 minuts, then rapid increase.	197	16½	24	0.61
	Start....	2	50 lbs.	197	....	24	0.36
	Moving..	2	10 lbs.	197	....	24	1.85

The Hyatt journal remained cool. The P. R. R. journal heated to 150 deg. F. for 2½ tons pressure. With the P. R. R. journal, it required five times the force to overcome the friction at the start that it took to keep the shaft in motion.

Knowing the usual fate and reputation of roller bearings, the proprietors of the Hyatt bearing have been content to hasten slowly in bringing their device before the public, and have cautiously introduced it upon a few lines to give it a practical test before claiming too much for it. It has been put to several uses on

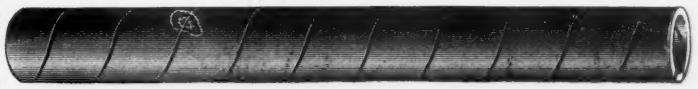


Fig. 1—Hyatt-Roller.

a jack shaft in the power house of the Edison Illuminating Company at Paterson. The shaft is 3 7/8 running at 360 revolutions per minute. Two months' service has shown no wear upon the bearings It has also been in use upon the Seventh avenue and Fiftieth street, New York, transfer tables, and is reported as requiring only one-fifth of the power that was formerly employed to move the tables. For car service it has been in use on an electric trolley line car between South Orange and Hamburgh Place for six weeks and is giving good satisfaction and appears to be superior to the present form of bearings in use on their cars, the recommendation given by the electrician of the company being that "there is no wear on the journal, the friction being thrown on the sleeve." They are also in use on the Paterson Central Electrical Railway on a trolley car and have been running for four months with 6,000 miles of travel, showing very little sign of wear. The car is reported as running easier than any other car on the road, takes less current, and, in the opinion of the company, is a good thing. Another use which has been found for these bearings is for bearings of trolley wheels, for which special sizes have been manufactured. Fig. 4 is an illustration of the rollers hsowing the guide to hold them in parallel position. The South Orange cars before mentioned have been running a trolley wheel fitted with these bearings for a time, longer than the usual life of the friction-bearing trolley wheel, with no appreciable wear between the wheel and the wires.

Fig. 4—Hyatt Rollers.

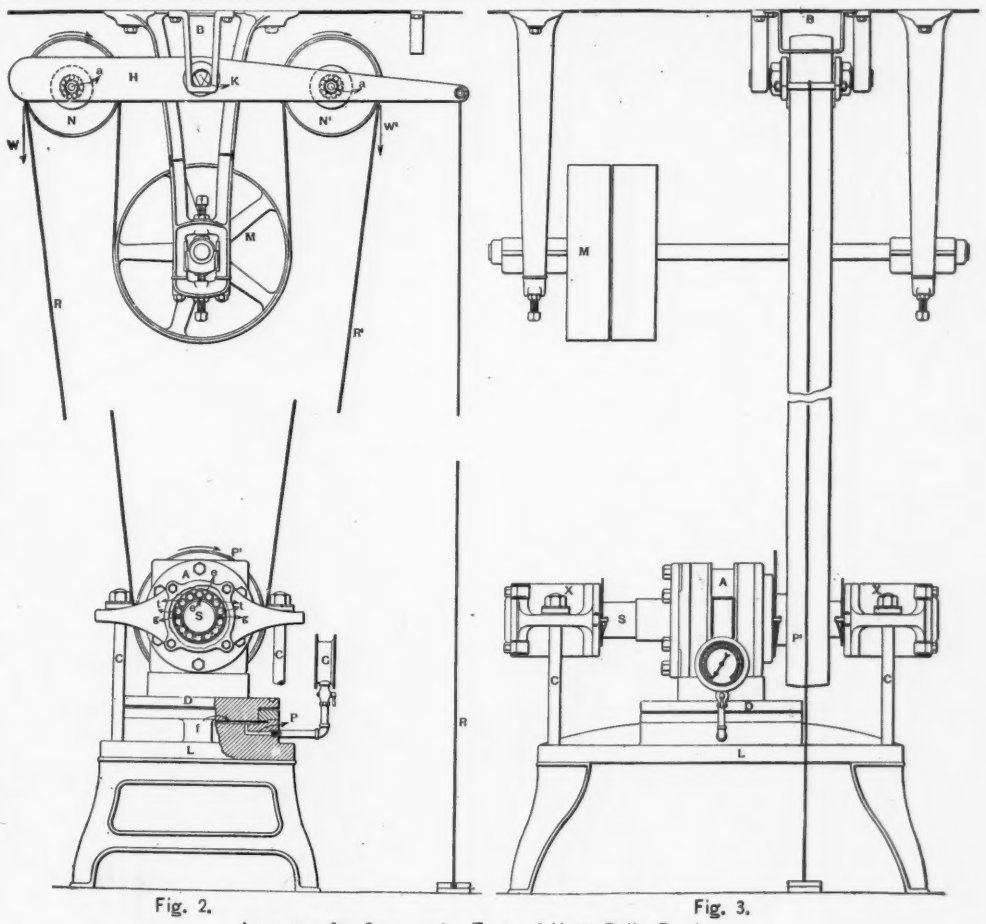


Fig. 2. Fig. 3.

Apparatus for Comparative Tests of Hyatt Roller-Bearings.

International Congress of Inland Navigation at the Hague, 1894.

The programme for this congress, which has recently been issued, deals with the following questions: 1. Construction of canals which allow a rapid transit. 2. Equipment of ports. 3. Prevention of blockades by ice. 4. Locomotion on canals and rivers. 5. Dues on navigable waters 6. Relations between the profile of rivers and the depth of their channels. 7. Regulation of rivers for low water.

Pittsburgh Compound Mogul Locomotive.

Herewith are illustrations of a compound mogul freight locomotive built by the Pittsburgh Locomotive & Car Works which is one of five locomotives that were exhibited by this company at the World's Fair. A general description and the dimensions are given in tabular form below. Some of the special features of the engine may be enumerated which are not given in the specifications. The guides and cross heads are of the Laird type, the former being of steel and the latter of cast steel with brass gibs. The connecting rods are also of steel, of an I section, and the parallel rods have solid ends. The pilot is of oak with a wrought iron bull nose. The boilers, cylinders and domes are lagged with wood and jacketed with planished iron. Pressed steel has been used for cylinder head, steam chest and dome top casings as well as for the sandbox top and lid and the smokebox front and door. The fittings include Westinghouse automatic brakes, Ross-Meehan brake shoes, Mack National injectors, Crosby steam valve and gage, Williams' head lamp and French springs.

The hauling capacity is given at 1,910 tons on a level at 20 miles an hour and 549 tons on a 53-ft. grade at the same speed; 400 tons on a 90-ft. grade and 215 tons on a 158-ft. grade at 10 miles an hour.

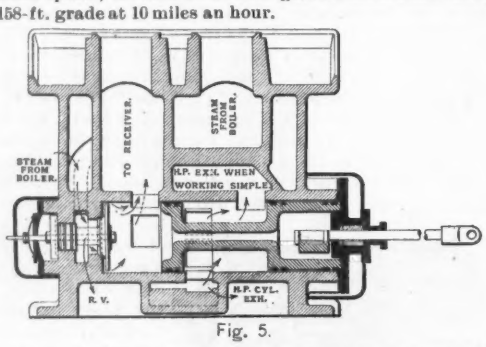


Fig. 5.

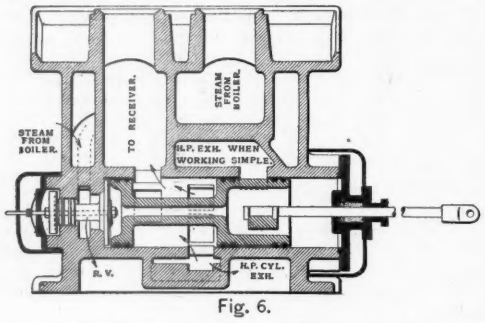


Fig. 6.

An especially interesting feature is the intercepting valve, by which the engine may be made to work as a simple engine or as a compound. The method of operating this valve is best illustrated by the engravings, figs. 5 and 6, which show the general arrangement of the intercepting and reducing valves. They are placed in the saddle on the high-pressure side, as shown in fig. 4 Fig. 5 shows the position of the intercepting valve when working simple, the passage to the receiver being opened to the reducing valve, which is free to act and admit live steam to the receiver. The high-pressure exhaust is also opened to the atmosphere as shown. In fig. 6 the intercepting valve is shown in the forward position for working compound, with the passage between reducing valve and receiver closed, while the exhaust of the high-pressure cylinder is directed to the receiver, by which it passes to the other side of the engine to the low-pressure cylinder. In the cab is placed an automatic air or steam reversing cylinder actuated by the movement of the reversing lever. When the lever is down or at full stroke the intercepting valve is in the position indicated by fig. 5, which permits the admission of live steam to the receiver, but the moving of the reversing lever one or more notches opens the valve of the reversing appliance, admits air or steam to it and moves the intercepting valve into the position shown in fig. 6. The dropping back of the lever to full-stroke again changes the valve, and the engine is made a simple engine as before. The operation of the valve and the passage of the steam is shown by the arrows in figs. 5 and 6. The reducing valve at the left may be also understood from the engravings. The passages of the steam to and from the cylinders is fully shown in fig. 4, a cross section through the cylinders.

Description:

Type	Mogul freight
Name of builder	Pittsburgh Locomotive and Car Works
Name of operating road, Columbus, H. V. & Toledo	
Gage	4 ft. 8½ in.
Simple or compound	Compound
Weight on drivers	100,500 lbs.
Total weight	116,200 "
Weight of tender, empty	28,800 "

General Dimensions:

Wheel base, total, of engine	20 ft. 10 in.
" " driving	13 ft. 2 in.
" " total (engine and tender)	48 ft. 4 in.
" " of tender	15 ft. 9 in.
Length over all, engine and tender	59 ft. 4½ in.
Height, center of boiler above rails	7 ft. 7 in.
" of stack	14 ft. 7 in.
Heating surface, firebox	161 sq. ft.
" " tubes	1,311 sq. ft.
" " total	1,472 sq. ft.
Grate area	24.2 sq. ft.

Wheels and Journals:

Drivers, number	6
" diameter, outside of tires	54 in.
Truck wheels, diameter	30 in.
Journals, driving axle, size	8 × 9 in.
" truck " "	5 × 9 in.
Main crank pin, size	6 × 5 in.

Cylinders:

Cylinders, diameter	H. press., 19 in; L. press., 29 in.
Piston stroke	26 in.
" rod, diameter	Both 3½ in.
Kind of piston rod packing	Jerome metallic.
Main rod, center to center	7 ft. 1 in.
Steam ports, length	H. press., 18 in.; L. press., 20 in.
" " width	H. press, 1¼ in.; L. press., 1½ in.
Exhaust ports, length	H. press., 18 in.; L. press., 20 in.
" " width	H. press., 2½ in.; L. press., 3 in.
Valves, kind of	Richardson balance
" greatest travel	H press., 5 in.; L press., 6 in.
" outside lap	H press., ¾ in.; L press, ¾ in.
" inside lap or clearance	H press., 1/16 in.; L press., 5/32 in.
" lead in full gear	H press., 1/16 in.; L press., 3/32 in.

Boiler:

Boiler, type of	Reduced shell
" working steam pressure	180 lbs.
" material in barrel	Steel
" thickness of material in barrel	7/16 and 5/16 in.
" diameter of barrel (smallest boiler ring)	58⅞ in.
Seams, Horizontal, kind of	butt joint, double lap, sextuple [riveted
" Circumferential, kind of	double riveted
Thickness of tube sheets	½ in.
Tube sheets, material	Steel.
Crown sheet, thickness	⅜ in.
Crown sheet, stayed with	Radical stayed.
Dome, diameter	2 ft. 6 in., ht. 2 ft. 2 in.

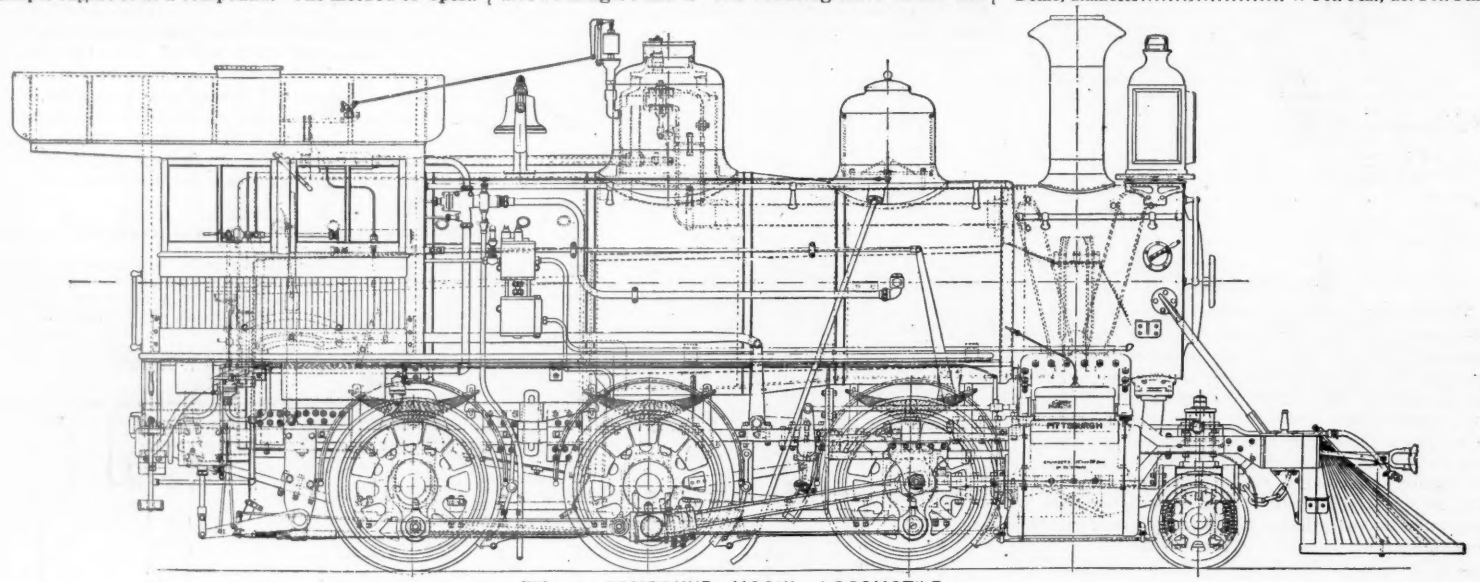


FIG. 1—COMPOUND MOGUL LOCOMOTIVE.
Built by Pittsburgh Locomotive & Car Works, *Pittsburgh, Pa.*

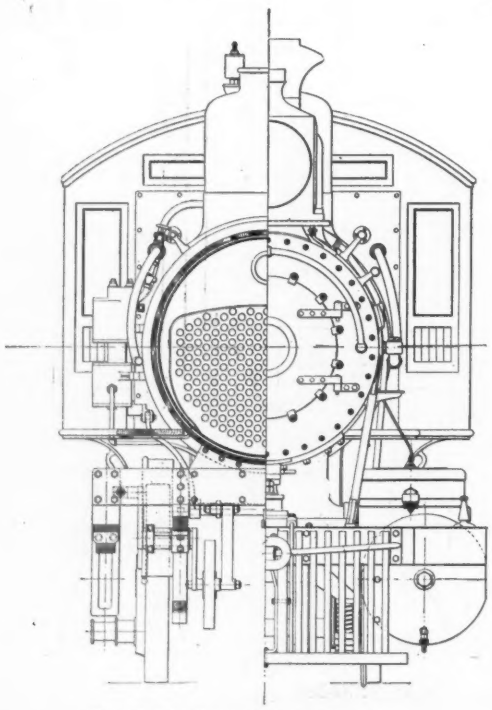


Fig. 2—Section and Front Elevation.

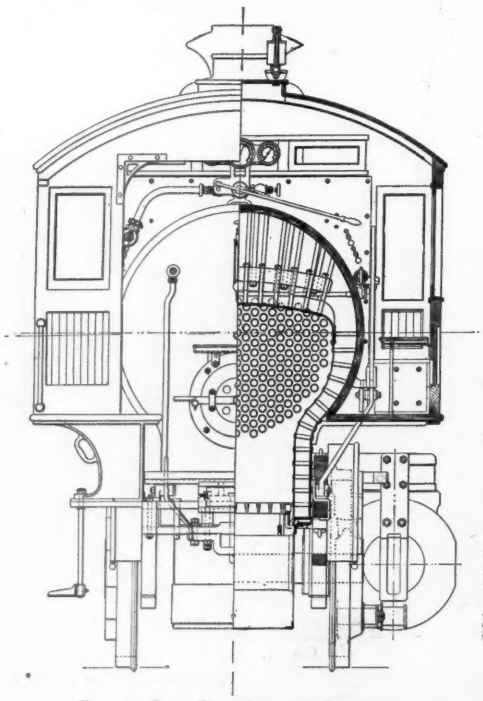


Fig. 3—Rear Elevation and Section.

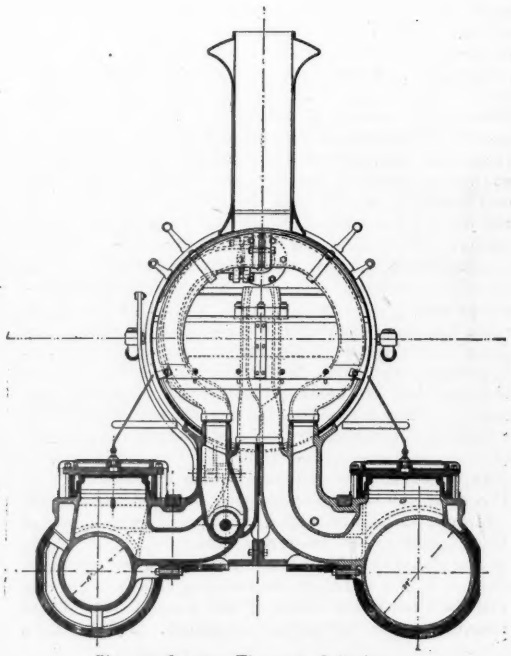


Fig. 4—Section Through Cylinders.

Tubes:	
Tubes, number	232
" material	Iron
" outside diameter	2 in.
" length over sheets	10 ft. to 10 ft. 6 in.
Firebox:	
Firebox, length	9 ft. 0 in.
" width	2 ft. 8⅝ in.
" depth front	72 in.
" " back	60 in.
" material	Steel
" thickness of sheets	Inside ⅜, outside ½ in.
" water space, width	Front, 4 in.; sides, 4 in.; back, 3½ in.
Grate, kind of	Rocking
Other parts:	
Exhaust nozzle, single or double	Single
" " diameter	5 in.
Stack, straight or taper	Straight
" least diameter	15¾ in.
Tender:	
Weight of tender, empty	28,800 lbs.
Number of wheels	8
Diameter of wheels	2 ft. 7 in.
Size of journals, diameter and length	4¼ in. × 8 in.
Total wheel base	15 ft. 9 in.
Distance from center to center of truck wheels	5 ft. 1 in.
Water capacity of tank (in gallons of 231 cu. in.)	3,600.
Coal capacity of fuel bin	7 tons

Improvements in Permanent Way and the Needs and Possibilities of Better Rail Fastenings.

By MR. WALTER KATTE,
Chief Eng., New York Central & Hudson River R. R.: M. Am. Soc. C. E.: M. Inst. C. E.: M. W. Soc. E.

The continued use in America of the common railroad spike for first class permanent way excites the wonder of foreign railroad engineers and is certainly not consistent with our steady and creditable advance in other lines of railroad construction. It is astonishing that we should hang on so persistently to this makeshift which has no proper place in permanent way. The only reason why we do, is that it seems to be cheap in the first cost. Surely it cannot be regarded as a permanent fastening. Its vocation is little more than that of the tacking and basting of the seamstress, and it is entirely out of place elsewhere than in temporary or construction tracks or in sidings not heavily worked. For main line tracks running 100-ton engines at from 60 to 100 miles an hour there is urgent need for something that will fasten the rails to the ties more securely than the common spike.

Probably most railroad officers, and especially those on whom devolves the duty of authorizing expenditures for supplies, still think the common spike both cheap and effective, whereas it is simply an extravagance masquerading as an economy. Its inherent weaknesses necessitate a whole retinue of expensive allies. Its thickness rarely exceeding $\frac{3}{16}$ of an inch, hence its bearing on the ends of the fibers of the tie is so small that it cannot withstand the thrust of heavy rolling stock, requiring on all sharp curves the use of the rail brace with double and sometimes triple spiking, where one efficient fastener ought to do the work. Again, this cheap device really does not bind the rail to the tie at all; it simply keeps the rail from jumping out of place. In a very short time after driving, the spike is drawn by the spring of the rail; it no longer binds the rail to the tie, and the result is "trip-hammer" action of the rail and consequent cutting of the tie. This we often see to a depth as great as three-quarters of an inch and even more, hence the second ally is called in, the "tie plate," which is needed merely because the cheap spike fails to do exactly what it was bought to do—hold the rail to the tie; and furthermore, as the cheap spike directly causes the cutting and hammering of the ties, they are brought to an untimely end under heavy traffic, with a loss probably of at least a fourth of the service that they ought to give. They are taken out of the track, not because they are rotted, but because they are pounded and cut out, by the motion of the rails and repeated re-spiking.

Now let us put this loss into the form of dollars and cents, and see what it costs to indulge in this cheap spike and its various allies. The cost of the fastenings on one tie is—

Four common spikes	4⅜ cents
Two extra spikes for the rail brace	2⅛ "
Rail brace, average	13 "
Two tie plates	10 "
Total	30 cents

A good Southern yellow pine cross-tie costs in New York from 53 to 55 cents, say 60 cents in the track, and ought to last at least nine years, but it is worn out by the processes above described in about six and one-half, so we have a dead loss of 15 cents per tie, to try to save which we invest 30 cents in these bolstering adjuncts on all ties to which it is necessary to apply them.

Appreciating the financial gravity of these destructive causes, I have taken considerable pains to ascertain with the closest attainable accuracy the proportion which ties taken out of track for renewal on account of this "cutting" and "hammering" destruction, bears to the whole number annually required for renewals on about 3,000 miles of single track, and found that it amounted to an average of nearly 20 per cent., from 10 to 15 per cent. being reported as "crushed or broomed," and from 4 to 10 per cent. "cut out" by re-spiking—this is derived from the average reports of all track foremen having charge of the renewals. On a line of railroad, therefore, requiring say 1,000,000 crossties annually for "renewals," nearly 200,000 of them are called for on account of this destruction—which may be fairly assumed to equal 2½ years of the natural life of the tie, and worth at least 6 cents per year makes 15 cents per year, or about $20,000 loss on the 1,000,000 crossties, costing at an average of 53 cents per tie, or 5⅝ per cent.—a loss surely of sufficient magnitude to demand some efforts for its suppression.

An attempt to devise some efficient and reasonably cheap substitute for the spike is the plan shown by fig. 1, consisting of a screw and clip fastening made of mild steel or wrought iron, but preferably of mild steel. The clips are made of a rolled shape in the bar, and cut off to length. The screws have pressed heads and raised cold rolled threads, with a pitch of 4 to 1 in. The general features of this device are in brief as follows: The screw will be of such diameter and length as the conditions of service may require, the point of the screw, blunt—cone—or gimlet, as may on trial prove to be best, the clip to be of cast, malleable or wrought iron, or of steel, cast, rolled or forged. It has a lip formed to fit to and hold down to the rail flange, and a shoulder formed to fit its outer edge to resist any tendency to change of gage. It is wedge-shaped, the upper plane being about parallel with the upper surface of the rail flange, the base of course horizontal. This clip has a slotted bolt or screw hole, permitting a lateral movement to provide for adjustment of gage without removing the screw from the tie.

The screws are to be entered into the tie by first boring a hole with a proper auger of a diameter equal to that of the screw at the root of its thread, the hole being at right angles with the upper face of the clip. A thin washer of iron and steel is interposed between the head of the screw and the face of the clip, entirely covering the slot hole and distributing the pressure of the screw head over a larger area of the clip and excluding water from the bolt holes. By this device the rails may be screwed down firmly, and securely fastened to the surface of the crossties, and held immovably to gage by the wedge shape of the clip in the jaw formed by the inclination of the under face of the screw head and the horizontal face of the crosstie, making it impossible for the rail to be moved laterally out of gage in either direction as long as the screws are screwed down firmly on the face of the clips. On the other hand, motion sufficient for adjustment of gage to the extent of ⅛ in. in either direction can be easily effected by loosening the screws on one side and tightening on the other. This screw and clip fastening is shown in fig. 1. The auger boring guide is shown in fig. 2. The use of the guide fixes automatically the exact point for

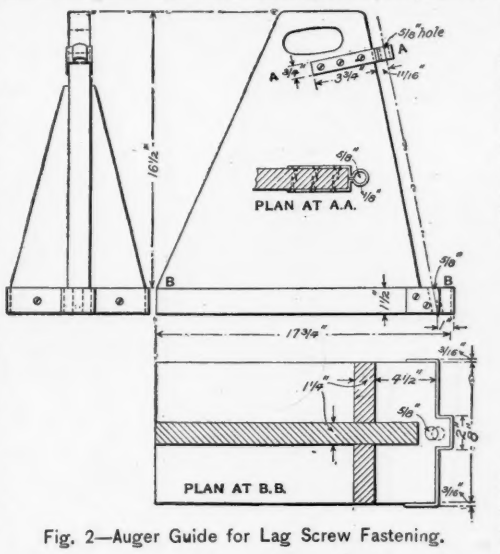


Fig. 2—Auger Guide for Lag Screw Fastening.

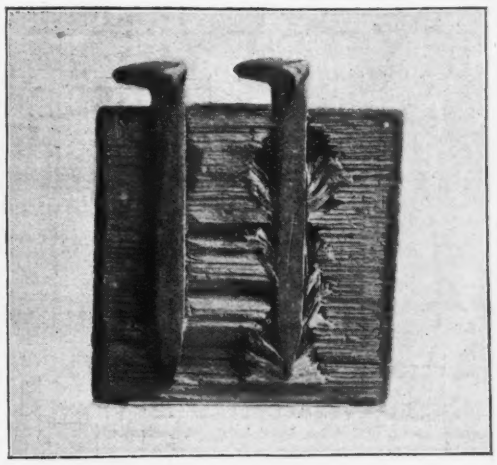
starting the screw hole as referred to its distance from the edge of the rail flange and also the angle of the hole in the tie. For metallic crossties a bolt bent in the neck and a similar form of clip are used, as shown in fig. 3.

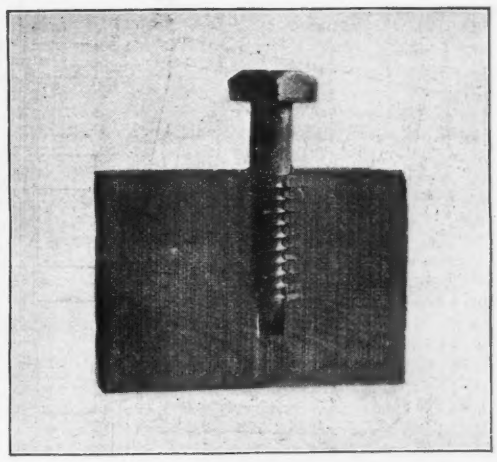
To get a close approximation of the cost at which this device could be supplied, I submitted it to leading manufacturers, who, after making practical tests, submitted to me perfectly satisfactory samples, and from them I learn that in large quantities the device can be made in steel at a cost not to exceed 4 cents per set, or 16 cents for one crosstie, single track (probably now, owing to the low price of steel, even less), as against 4⅜ cents for four spikes per crosstie, or a little less than 3½ times as much. This is very little when the loss by damage to the tie and cost of the tie plates and rail braces are considered. For example:

Damage to crosstie	15 cents
Two tie plates	10 "
One rail brace	13 "
Two extra spikes	2 "
Total per tie	40 cents

The following illustrations, made from photographs of actual samples, exhibit distinctly the injury done to the timber by the common spike, contrasted with that of a screw.

I have read with much interest the articles by Mr. Charles Paine and Mr. T. C. Clarke in the *Railroad Gazette* of Nov. 3 and Nov. 17, 1893, on "Future Railroad Track." Admirable as they are and useful in drawing attention to an important subject already too long neglected by the railroad engineers of this country, I can scarcely agree with the writers that permanent way of the Haarmann-Victor type is of great promise in this country, at least for many years to come. It is too complicated and costly, and too wide a departure from established American practice to make much





headway with the present generation of American engineers, general managers and financiers. After all, the practical phase of this matter is that the engineer of maintenance of way must work with what the executive and financial officers give him. What he can do is rather a question of finance than of engineering, and from my own experience of many years I doubt if financial officers will think it good railroading to pay for such an expensive type of perma-

Rail Seat "Hammering."

nent way for many years yet, and that before such types are considered we will probably pass through an intermediate stage—a transition type as it were—it may be even now possible to introduce a transition type which will be a great improvement on existing track and yet economical enough to meet the approval of financial officers. For such advanced type of track I would advocate the use of chemically preserved crossties, using any process that will prolong the life of the crosstie to, say, 12 or 15 years, instead of from five to nine years, its present life. My investigations of the Welhouse zinc-tannin process lead me to think it reasonably certain that hemlock or beech ties costing 35 cents can be treated by this process at a cost of about 18 cents,-making a total of 53 cents and increasing their life to 12 to 15 years; depending of course to some extent on the original quality of the timber and largely on the thoroughness and skill with which the process is carried out; an increase of from 50 to 75 per cent. in the life of the tie means a vast sum of money saved in maintenance of way. I would next banish at once the common spike and use some clip and screw fastening similar to the plan I have suggested, and then, if after trial found necessary, put tie plates under the joints, only where I am satisfied they would alone be needed. Rail braces will not be needed if the web of the rail is properly shaped and has sufficient sectional area, and firmly held from tipping or spreading by a screw and clip fastening. The next step in advance would be the use of steel crossties, in the use of which my personal experience has been limited, but so far very satisfactory. Crossties of the "Hartford model" have now been in use near Garrison, on the Hudson Division of the New York Central & Hudson River, for over four years, and are giving excellent results; 800 of them were put down. We have now on hand 18,000 of a modified form, fig. 3 (reproduced from the *Railroad Gazette* of July 22, 1892), made by the

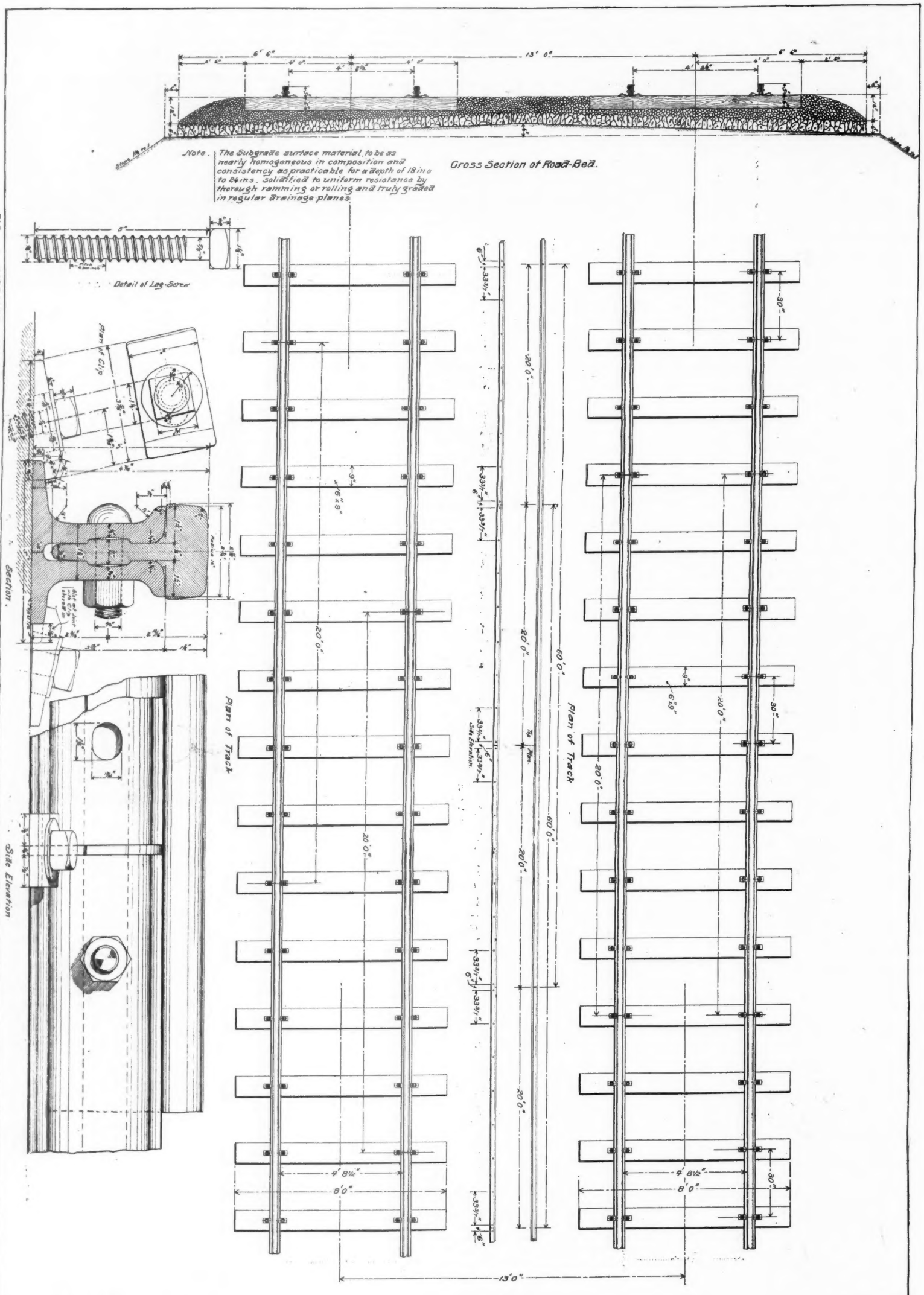

Gross Section of Road-Bed.
Note. The Subgrade surface material, to be as nearly homogeneous in composition and consistency as practicable for a depth of 18 ins to 24 ins. Solidified to uniform resistance by thorough ramming or rolling and truly graded in regular drainage planes.
Detail of Lag-Screw
Plan of Clip
Section.
Side Elevation
Plan of Track
Plan of Track
Plan of Track
Side Elevation
4' 8½"
8'0"
20'0"
60'0"
13'0"

FIG. 1—IMPROVED PERMANENT WAY—COMPOUND RAIL, SCREW AND CLIP FASTENING, CHEMICALLY PRESERVED WOOD TIES, STONE BALLAST.

With Paper by Mr. WALTER KATTE.

Plan of Tie.

Section on B.B.

Cross Section of Road-Bed.

Note. The Subgrade surface material to be as nearly homogeneous in composition and consistency as practicable for a depth of 18 ins. to 24 ins. Solidified to uniform resistance by thorough ramming or rolling and truly graded in regular drainage planes.

Plan of Track

Plan of Track

Plan of Track

Plan at A.A.

Detail of Bolt

Plan of Clip.

Section.

Side Elevation

FIG. 2—IMPROVED PERMANENT WAY—COMPOUND RAIL, BOLT AND CLIP FASTENING, STEEL TIES AND STONE BALLAST.
With Paper by MR. WALTER KATTE.

Schoen Manufacturing Company, which will be laid under the four tracks in Fourth avenue tunnel between Fifty-fourth and Ninety-seventh streets next spring. But the cost of steel ties ($2.50) is yet so great as to prohibit their general use for many years, and meantime we will probably go through a period of chemically preserved wooden ties, or a resort to the extraordinary durable Australian timbers Iron Bark (*Eucalyptus sideroploia*) and Jarrah (*Eucalyptus marginata*), which, judging from reports of most undoubted credibility, seem to be well-nigh indestructible, and able to defy alike all attacks of heat, or cold, wet or dry rot, and even of the teredo and other boring seaworms. Samples of this timber are extant to-day in Australia of its use for piles, wharf logs, flooring planks laid directly on wet ground, shipbuilding, stakes, posts, cemetery slabs, etc., etc., of from 20 to 65 years of age, and as perfectly sound to-day as when first cut. I have examined samples of it brought to New York and regard it as certainly an ideal timber for crossties, its spike-holding and abrasion-resisting ability being fully equal and probably superior to the best of American white oak, and of much greater durability where exposed to moist atmospheric action. The great cost of transportation is, however, against it as yet. Its price in Australia at this time is quoted at about 60 cents per cubic foot and in London about 62 cents, so that a tie of 6 × 9 in. by 8 ft. (3 cu. ft.) would cost $1.80. I have been informed, however, that parties have offered to import a cargo to New York at about $1.75 per tie. Probably in the future the ocean freight rate may be much reduced, and they may be landed in New York at say $1.50 each. If they last good, say only 25 years, the annual cost would be only 6 cents per year, or the same as the cost of our best quality of Southern yellow pine, worth in New York about 54 cents per tie, and good for nine years life, or 6 cents per year; but this Australian timber weighs nearly double (63 lbs. per cubic foot) that of yellow pine hence its superior qualities for spike holding and resistance to abrasion.

The next important element is the joint. Certainly there is no lack of types and fashions eagerly thrust forward, each one asserted to be the best ever devised. The rail joint selling agent is now almost as persistent a nuisance as the proverbial book peddler or insurance agent. But among the many designs there are of course many very good joints, and no engineer need despair of finding one if he takes the trouble to look it up. But has not the time now arrived to turn the stream of inventive genius from the improvement of the joint to its absolute elimination? Here is an opportunity for the most brilliant and valuable achievement. If we can get rid of the joint altogether, what an economy in first cost and subsequent maintenance, and what an improvement in track we may bring about! The first step in this direction is the proposition to reduce the number of joints by using a longer rail, say, 45 or 60 ft. or even 90 ft. In this direction investigations are now in progress by a committee appointed by the General Managers' Association, of which Mr. Thomas Rodd, Chief Engineer Pennsylvania lines west of Pittsburgh, is the Chairman. From this committee we shall doubtless get some very valuable information, for experiments of considerable magnitude have been made, especially on the Pennsylvania, Lehigh Valley and Norfolk & Western roads, with 60-ft. rails, and it is reported that the London & Northwestern R. R. Co. have already adopted 60 ft. as a "standard" and are now altering their own rail mills at Crewe to produce that length. My own impression so far is that it will be not only practicable, but economical, to use 60-ft. rails; that the mills can furnish them at a very small increase, if any, over the price for 30-ft. rails, trackmen will soon learn to handle them conveniently, and that the increased cost of transportation will be practically insignificant. The outlook for getting rid of half the joints is, therefore, certainly encouraging.

But why not see if we cannot get rid of the joints altogether? The idea of electric welding may as well be dismissed at once so far as the standard steam railroads go. There is not a practical engineer of maintenance of way living who does not at once see the impossibility of carrying on the day by day routine of track work on an operated railroad of large traffic with the rails solidly welded for miles.

But is there not a possibility in the compound rail? I know it has been tested and found wanting from very early times, but I do not believe that its capabilities have yet been exhausted. There is good reason to suspect that many of the failures may be traced to crude and imperfect construction in the forms of the rails proposed and the unfavorable conditions of support, and roadbed, under which the trials were made. I believe it is possible to devise a form of compound rail of two and three members that will give complete satisfaction and economical results, and by way of a preliminary suggestion I offer a type which I have had the temerity to devise. Fig. 4 shows a cross section of my design. Of course the upper member would be of hard high-carbon steel, supported continuously under the sides of the head, and as it would have to resist only compressive and abrasive action it could be made as hard as could be conveniently rolled. The side members would be symmetrical, and so require but one set of rolls, and they would be of low carbon and tough and elastic. The fitting surfaces are tapered slightly to increase the strain on the coupling during the passage of the rolling load, so that the members would be, in fact, strained together more tightly under load than when unloaded. The bolt holes would be slotted longitudinally to provide for expansion. It is proposed to roll the members in 60-ft. lengths, making a joint in one member only every 20 ft., each partial joint being therefore thoroughly fished by the unbroken metal of the other two members.

Such a rail would be, practically, a continuous rail, and would have many advantages; it would have no splice joints or fish plates. The crossties would be equally spaced and equally loaded. There would be no "low joints," no battering of rail ends, the side members would outlive by many years the top members, and the latter could be readily renewed or turned end for end so as to utilize both sides of the rail-head. Thus less than one-third of the whole rail would go to the scrap pile, whereas now the whole rail often has to be renewed on account of only a little wear on the head, the material lost by wear being but a trifling fraction of the weight of the rail. This compound rail could be easily connected to ordinary rails by having on hand 20-ft. and 40-ft. lengths of each member to even up and then be connected by use of special splice bars, with any ordinary rail, switch or frog.

Finally to make an ideal track the very first essential is a first-class roadbed. The subgrade should receive very careful attention, much more than is ever given to it now. It is essential to good permanent way that the subgrade for a depth of at least 12 to 18 in. should be composed of carefully selected material of uniform character both in cuts and fills. In cuts, if the material found in them is of improper character, it should be excavated and good material put in. This top dressing should be brought throughout to a uniform consistency by ramming or rolling, and the surface dressed to regular, uniform drainage planes, conducting the water to the ditches or slopes; these planes sloping uniformly from the center line on an inclination of about 1 in 10, not crowning or rounding, for that shape does not shed water as freely as uniformly sloping planes, the central arc being so nearly level it lacks drainage slope, eventually depressing and tending to hold water along the center line. The side ditches must be ample and carefully graded. This matter of the subgrade and the ditching and sub-drainage is fundamental to a good roadbed and track. Not a shovelful of ballast should be put on until the roadbed has been inspected, tested and accepted by a competent expert.

The ballast should never be less than 12 in. in thickness below the bottom of the ties, and 18 in. is better. It may be of clean, sharp gravel, with all stones larger than 2½ in. diameter carefully screened out, or it may be of a good blast furnace slag crushed nearly uniform in size, not larger than 2½ in., or of clean coal cinders (not ashes). The latter, however, is not good for the entire depth of the ballast, it needs a substratum of coarse gravel, broken stone or slag. Finally, the best of all ballast is broken stone of sound, hard limestone, trap, granite or any other sound rock not easily crushed, ground up, or disintegrated by freezing and thawing. It should be broken to nearly uniform size, not less than 1 or 1¼ in. in diameter, not more than 2½ or 3. The bottom course, however, should be laid with fragments of 4 to 6 in. in size, roughly laid up by hand similar to the bottom course of Telford pavement, but with less hand labor. This gives an efficient subdrainage and effectually prevents freezing and heaving.

Use crossties of chemically treated or Iron Bark timber, or rolled steel or iron.

Use a screw and clip fastening, adjustable for gage, to immovably hold the rail to the tie.

Finally use steel rails 60 ft. long or a compound continuous steel rail.

Such a permanent way will, in my judgment, be more economical in the long run than the best examples of the present type and will be found sufficiently satisfactory to make it unnecessary to resort to types like the Haarmann-Victor for a generation or two yet.

Chicago Traffic Matters.

Freight Traffic.—A severe drop in the temperature and prevailing snowstorms over the entire Northwest and Southwest, coupled with unsatisfactory prices severely curtailed both the deliveries at and shipments from interior stations, but the business of the railroads was very fair considering the adverse conditions noted, the aggregate deliveries of grain by the 11 leading lines for the week being 2,654,000 bushels, compared with 4,065,000 bushels last year, 3,102,000 bushels in 1892 and 2,499,000 for the same period in 1891. There was a shrinkage in inbound freight, especially live stock.

Liberal supplies of coarse grain are still held in the interior, but no large movement is expected for weeks to come. Grain receivers say that farmers hold back as much of their grain as possible. The grain receiving houses think that the cut by the Atchison, Topeka & Santa Fe of 8 cents on corn and 9 cents on wheat from Kansas City to Chicago was uncalled for and injudicious from the fact that about all the wheat and corn that could be attracted from that section during the coming two months has already been marketed.

The following shows the deliveries of flour (bbls.) at Chicago by the leading Western railroads for the week ending Jan. 27, and for the corresponding time the three preceding years:

	1894.	1893.	1892.	1891.
C. & N. W.	13,834	40,925	26,768	31,922
Ill. Cent.	300	900	.....	70
C., R. I. & P.	2,450	6,000	1,375	4,375
C., B. & Q.	5,268	18,091	10,110	18,800
C. & Alton	450	2,680	1,750	990
C. & E. Ill.	150	3 0	.....	.....
C., M. & St. P.	16,900	32.700	23,050	28,205
Wabash	.....	900	1,475	500
C. & G. W.	7,767	14,624	16,172	1,865
A., T. & S. Fe	.....	450	.....	375
L., N. A. & C.	.....	.....	.....	33
Totals	47,119	170,570	80,700	87,135

The following shows the deliveries of grain (bushels) at Chicago by the leading Western railroads for the week ending Jan. 27 and comparisons with the three preceding years:

	1894.	1893.	1892.	1891.
C. & N. W.	452,000	768,000	591,000	764,000
Ill. Cent.	455,000	301,000	334,000	689,000
C., R. I. & P.	309,009	459,000	524,000	137,000
C., B. & Q.	506,000	947,000	621,000	173,000
C. & Alton	174,000	174,000	94,000	51,000
C. & E. Ill.	39,000	261,000	94,000	58,000
C., M. & St. P.	396,000	679,000	596,000	443,000
Wabash	108,000	65,000	45,000	46,000
C. & G. W.	79,000	168,000	88,000	71,000
A., T. & S. Fe	130,000	243,000	115,000	67,000
L., N. A. & C.	6,000	.....	.....	.....
Totals	2,654,000	4,065,000	3,102,000	2,499,000

Passenger Traffic.—The local passenger business is increasing. Southern resort and California travel is better, but the lines to Oregon and other sections in that direction complain of very slack business. But, in Montana the mining interest is said to be having a decided revival.

CHICAGO, Jan. 29.

Railroad Property Records.

BY ROBERT A. CUMMINGS, ASSOC. M. AM. SOC. C. E.

Realizing the enormous capital invested in real estate, more especially by corporations, it is astonishing to find that their records are so often inaccessible, incomplete and of questionable accuracy. Where is the railroad company, for instance, that can show an absolutely clean record of all its property and real estate? If there are any able to do so it will speak volumes for them and prove the rule by exception. For the improvement of usual practice the engineering and legal departments must exercise a studied judgment to obtain beneficial results. The engineer, in putting on his legal spectacles, should see to the proper terms and minuteness of the description and observe that the "aforesaid" lawyer has framed his part of the "agreement" with an exuberant verbosity. He must continually bear in mind that his starting point must be accurately fixed with reference to permanent and independent landmarks, and then perambulate the boundary with the true meridian, instead of a magnetic variation, finishing the last course with the satisfaction of the man who closes his traverse by "hitting the tack" at "the point of beginning."

By way of exception and under the immediate direction of the writer, while in charge of the construction of the Columbus Connecting & Terminal Railroad Company (Norfolk & Western Columbus Terminals) and in similar work elsewhere, the following described records for railroad property have been compiled to illustrate a method at once clear and complete.

All "agreements" and purchases of the propertie, were entirely in the hands of the legal department, advised by the engineering staff, the combination silently and skillfully executing their "deeds" with consummate ability.

"Beginning at a point" where the average engineer is interested, the fieldwork was very simple; the ordinary form of notes and notebooks being used, no strategies were necessary. The various pieces of property were of very irregular shapes, some of the adjacent lines disagreeing; therefore, independent surveys were made of each owner's property and adjoining lines to secure accurate deeds. With the assistance of reputable local surveyors and their influence these property lines were more readily and accurately determined. The valuable data concerning local disputes and errors of old surveys were easily secured, the importance of which more than justified the extra assistance. Angles were taken with a combination transit, magnetic bearings being read from the compass for checking. Measurements were made with a 100-ft. steel tape, frequently compared and tested with a standard.

Ordinary stakes were used, but at the corners and every 100 ft. on the curved lines permanent monuments, made of wrought iron rods 1½ in. in diameter and 6 ft. long, were substituted and driven 5 ft. into the ground. Around the projecting one foot of rod, the earth was heaped up and leveled with the top of the rod; this was done to enable the monument to be easily found in the long grass or snow, besides shielding it from injury. The exact point on the top of the rod was accurately marked by the intersection of lines, at right angles to each other, made by a cold chisel carried for that purpose.

Comparisons were made with previous surveys and the work carefully checked, any discrepancy found being

immediately rectified. Subsequently all the independen surveys were connected with the center line of final location by angles and measurements. All the property lines were referenced by angles to the true meridian from the center line of final location, the tangents of which had been previously determined. No hairsplitting methods were adopted except those one would naturally observe through a transit, because accuracy in work is synonymous with modern methodism.

The proper arrangement for the maps and records involved considerable study, inasmuch as precedents were not available, and experience dictated the necessity of an improvement on old methods. The descriptions for the deeds were carefully prepared, accompanied by a neat reference map made to a suitable scale on the blank page at the back of each deed. The deeds were very carefully and neatly copied into leather-bound blank volumes, to be known as deedbooks, forming the permanent office file. After being recorded at the county record office they were filed with systematic order for ready reference and safe keeping.

From copious field notes the center line of final location and the property surveys were accurately plotted on tough and durable white drawing paper, 60 in. wide and of the required length, with a scale of 100 ft. to an inch. By consulting local and county athorities, maps, records, etc., a large quantity of important information was added concerning adjacent properties designed to be of use for future need and reference.

It was considered best to confine the information on the map simply to the property of the company and adjacent owners; therefore, no topography was shown except features referred to by the deeds. The courses were plotted with reference to the true meridian by fixing a large protractor in position and pricking off all bearings required for three lineal feet of the map in any direction from the protractor, and transferring them with steel straightedges. By this means accumulative errors were practically eliminated.

The circuitous route and short length of the line necessitated a special arrangement of the map, not advisable in ordinary cases of a continuous railroad. The extent of the information required a more convenient form for reference; therefore, a complete volume of tracings was made on the dull side of imperial tracing cloth, subdividing the large map into a series of small plans 21 in. × 30 in. The tracing cloth was used with a view to blueprinting any part of the property and reproducing the volume for distribution among the operating and legal offices. The top and bottom of the plans were the north and south sides, and the right and left hand the east and west sides, respectively. Each plan had a border of a heavy line on the outside and a fine line on the inside, one inch from the north, south and east edges, and an allowance of two inches from the west edge for binding. Adjacent plans overlapped each other in order to show a piece of property complete, and the index map, to be subsequently mentioned, clearly indicated the amount of overlapping and location.

In making the tracings appropriate utility was observed in drawing. No unnecessary ornamentation was done, and clean solid lines with a black opaque ink were the rule. The distinguishing lines used for reference were arranged to make the company's property apparently stand out from the map. This was accomplished by using for the property boundary a very heavy broken line of three dots and a dash 1/8 in. long, heightened by a solid line of carmine color, drawn with an ordinary drawing pen of the same width and as near as practicable to the boundary line. This color blueprinted satisfactorily and answered every purpose.

Former property lines were drawn fine and broken with three dots and a dash 1/8 in. long; all other property and lot lines were made fine and broken with one dot and 1/8-in. dash. Section lines were of medium thickness and broken with successive dashes 3/8 in. long. Corporation lines were indicated heavy by a 1/8 in. dash and five small dashes for 1/8 an inch. Township lines had two heavy dashes 1 in. and 1/8 in. long respectively. Streets and alleys were suitably shown in heavy and fine lines, assuming the light to come from the northwest corner of the map. The center line of location was represented by a solid vermilion line, every fifth station being indicated by a small mark and numbered in the proper order on the basis of a unit being a 100-ft. station. The center of a 1/16-in. circle in the center line referred to the beginning and end of the circular curves. Alignment notes of pluses, curves, angles and the bearings of tangents in reference to the true meridian were plainly shown in upright characters. A neat meridian and the magnetic variation "North points" were drawn in the north half of each plan at a convenient place. No angles were shown, but the bearings of all courses being referenced to the true meridian were bracketed on the outside of the boundary line, and distinguished by small upright characters with the initials T. M. after them.

The original deed bearings were magnetic (common courses invariably disagreeing), and were placed in small characters on the inside of the boundry line. The actual measurements that were used in the deeds were neatly shown by small block figures on the outside of the boundry line; the original deed measurements were bracketed on the inside of the property line. Original bearings and measurements were shown on one side only of the interior property lines, and the actual bearings and measurements on the other side.

All deeds were described in accordance with the new and correct measurements, the old measurements being summarily discarded; no exceptionally large variation occurred to bring up a probable suit, the property being mostly purchased by the acre.

On the plans, the names of the grantors were written between the property lines in large italics, and the next previous owner's name bracketed in small italics directly underneath the grantor's; the acreage was written in block figures under the above.

Names of streets and alleys were in large light square block letters; railroads, adjacent owners and section lines were in small light square block letters. In large italics, outside and along the border line, the names of ranges, township lines, etc., were noted. The particular section in which the plan was located was indicated by 1/8-in. skeleton shaded block letters evenly separated.

Where the property was in small lots and the space too cramped to write the owner's name, etc., a capital block letter in quotation marks was used, and a reference table made in an open part of the plan in which the necessary information was given. The plans were numbered consecutively with a Roman figure 1/8 in. high in the northeast corner, commencing with plan No. 1, which contained station 0, and continuing to the end of the line.

In addition to the plans, a complete record of the property, condensed from the deeds, was shown by tabulated sheets of tracing cloth, corresponding in all dimensions to (and to be bound with) the plans, and arranged similar to the form shown below:

The owners' names were placed alphabetically without reference to location, except where an owner was mentioned more than once, when the record was arranged in the order of location on the center line.

Accompanying the condensed record of property and plans was an index-map on tracing cloth, of similar dimensions, to a scale of 500 ft. to 1 in. This map formed the frontispiece to the volume, and was more ornamental than the property plans. Section, range, township and corporation lines, railroads, principal streets, prominent buildings, etc., were shown, with the object of making a ready reference map. The border lines of each plan were indicated by a fine vermilion line on the index map. Within the spaces thus inclosed the number of the plan in Roman figures was placed.

The above description of railroad property records is a compilation from many sources, intended to be a suggestion for improving records rather than a model to follow, as each case requires its own treatment.

Measuring and Percent Gage.

Herewith is an illustration of the Riehlé measuring and percent gage, made by Riehlé Brothers' Testing Machine Company, Philadelphia, an ingenious device to measure the percentage of elongation of tensile specimens. It has eight notches 1 in. apart and is 12 in. long, the 4 in. beyond the notches being laid off and graduated to show the elongation in percent without figuring. On the under side is a shoulder running with the length of the scale, so that the lines scribed to show the inches will be across the testpiece at right angles to its axis. The scale is used either with the lines scribed with this instrument or with pieces laid off with the double pointed center punch.

It should be a great saver of time, and its use eliminates the possibility of error in measuring extensions and figuring the percentage. For pieces laid off in lengths other than 8 in. the percentage scale is in proportion. For 4-in. measurements the reading is doubled, and for 2 in. measurements it is quadrupled.

McLewee Automatic Safety Gage.

Herewith is given a cut of the McLewee automatic safety water gage, one of the chief features of which is an open metallic casing about the glass to protect it from breakage. This casing consists of two halves hinged at the back *N*, and fastened by a clasp or locking device *M K*. The casing is punched full of round holes or windows *W W*, which enables the engineman to see the column of water in the inclosed glass tube *H*. The metallic casing is lined with a sheet of mica *I*, which, being transparent, leaves the column of water in view, but protects the glass tube from the free circulation of the air.

The casing and mica are riveted together as shown in the cut by the rivets *V V*. Special attention is called to the packing at the top and bottom of the glass tube. It is best shown at the top and consists of a collar *F* with a gasket *T* backed up and kept tight by the packing *R*.

The attachment to the boiler is effected in the usual manner, except that this gage has an automatic check valve to prevent scalding when the glass is broken. This is shown at *L*, in the section the ball is kept in place by the spring *S*. This ball may be forced back by the stem of the hand-wheel *X* and the passages blown out through the petcock *P*.

McLewee's Automatic Safety Water Gage.

The advantages claimed for this water gage in addition to those mentioned are: (1) the facility with which the water glass can be removed and a new one inserted; (2) the ease and rapidity with which packing can be removed and replaced, enabling an engineman to take out and clean his glass every day if he so desires; (3) the tension is on the ends instead of on the side of the glass, and the method of packing prevents the glass from being broken, by crushing it against the metal.

The gage is manufactured by F. McLewee & Son, 25 Waverly Place, New York City.

Reconstruction of the Towers of the Iglava Viaduct.

The towers of the Iglava Viaduct of the Austrian Vienna-Bruenn Railroad were recently rebuilt, as described in the *Zeitschrift des Oesterreich. Ing.- und Arch.- Vereines*. The single track viaduct crosses the valley of the Iglava with six openings, each of 203 ft., consisting of continuous deck lattice girders, which rest on towers 90 ft. high. Each tower was composed of four cast-iron tubes which were filled with concrete and braced together. The cast-iron columns began to crack principally from the freezing of moisture between concrete and shell, thus damaging the viaduct. It was decided to replace the cast-iron pillars by wrought-iron ones, built inside of the old towers. The two adjoining columns of the two bents of each of the new towers are capped by a box girder, which carries on its center, on a roller nest, the lattice trusses. After the new pillars had been completed, the superstructure, the weight of which amounted to about 250 tons for each span, was lifted by hydraulic presses off the old pillars and let down on the new structure. The bearing on one abutment is fixed, while the other abutments and the five towers have roller bearings. The structure, 1,218 ft. long, moves thus as a whole.

A. B. & C. RAILROAD COMPANY.

.....COUNTY.
.....STATE.

RECORD OF PROPERTY.

DATE.....

Plan.	Initial No.	Office of Asst. Engr.		Grantor to Railroad.	Next Previous Owner.	Character of Title.	Date of Title.	Consideration.			Station to Station.		Dimensions.		Shape.	Acreage.	Locality.	Location.					County Record.						Conditions, Etc.
		Deed Book.	Page.					$	C.	Payment.			Length.	Width.				Twp.	Lot.	Range.	Survey.	Section.	Deedbook. Vol.	Deedbook. Page	Deedbook. Date.	Platbook. Vol.	Platbook. Page	Platbook. Date.	
5/8"	5/8"	5/8"	5/8"	2"	2"	1"	1"	1"	1/4"	1 1/2"	3/4"	3/4"	3/4'	3/4"	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/4	1"	1/2	1/2	1"	...3 3/4"...
..... 27"																													

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The three-cornered fight over the New York & New England receivership, between the bondholders, the management and the stockholders has resulted in the defeat of the stockholders' candidate. Judge Colt, of the United States Circuit Court at Boston, confirmed the appointments of Judge Wallace, of the New York Circuit, by appointing M. D. Perry, of Providence, and T. C. Platt, of New York, permanent receivers for Massachusetts and Rhode Island. This puts the road into the hands of two of Mr. McLeod's directors, and it will be interesting to see whether these men will pull in the same or contrary directions. The question that promised the greatest interest, however, has been settled, pending the decision of Judge Townsend, before whom there is a petition for a special receivership for the state of Connecticut. It looked at one time as if receivers might be appointed for each of the three districts, which would have led to no end of conflict and confusion, not only between different interests of the road, but between the different Courts. Judge Colt foresaw these and avoided them by concurring in the appointment of the New York Court. As he said, obedience to the rule of comity required him to confirm the appointments, and any other rule which permitted a federal judge in another jurisdiction to appoint another receiver would only result in great injury to the property as well as bring reproach upon the administration of justice. The Court requires bonds for $100,000 from each of the receivers, and directs that an order be drawn similar to the one entered by Judge Wallace, of the New York Circuit, and that any one desiring any modifications in it shall apply to the latter Court. In the face of this dictum Judge Townsend will hardly be expected to appoint a separate receiver for the state of Connecticut. The attorneys of the receivers premise great things for the road under the management of their clients, and charge the different factions with selfish and traitorous motives, as only lawyers can. Mr. Platt's attorney in his arguments is reported as asking for six months to give the receivers' plans time to mature, and to have declared that they were going to build an entrance to New York and frustrate the schemes of the New Haven road. Mr. Perry's lawyer is reported as having argued that there really was no need for a receiver. General Swayne, representing the stockholders, handled Messrs. McLeod and Platt without gloves, and thought that the recent actions of Messrs. Prince, Perry and Platt should be thoroughly investigated. Mr. Platt is credited with having expressed his determination to administer the affairs of the road in the interests of the shareholders, and at the same time to have stated his friendliness to Mr. McLeod. It will be interesting to learn whether his "shareholders" are bona fide owners of the stock and bonds, or are speculators who control the stock on margins.

Railroad Receiverships.

The struggle over the New York & New England receivership calls attention to the importance now attached to the position of receiver of a large corporation, in a strategic sense. Now the first mortgage holders want the prominent voice, and now the seconds; or perhaps the stockholders or the floating-debt creditors wish "representation"; with the result oftentimes that three or even more receivers have charge of a property. All this shows how completely we have departed from the original conception. At first when a company became unable to pay its debts, the courts appointed a receiver who took possession of all assets, sold them to the best advantage within a given time and distributed the proceeds proportionately among the creditors. Thus such an appointment was the first step toward a winding up of the affairs of the company. Putting a company into the hands of a court was a proceeding not intended as a way of continuing the business, but grew naturally out of the conflict between the strong terms of the mortgage which allowed absolute foreclosure on the one hand, and on the other the paramount duty of the railroad to keep its trains running for the public convenience. The only way out of the dilemma was to have the road kept going, but under the direction of the court.

Following this line of thought, the early cases bespeak the care with which the judges considered all appilcations for the issue of receivers' certificates which should be a lien on the property ahead of the mortgages whose rights were long held sacred. Such certificates could be issued only for wages or like charges, such as would have to be paid by the bondholders in any event. Then we find the courts taking a wider view of their duties, and after hearings consenting to prior liens for any purpose which seems for the ultimate good of the property. Thus it often happened that a receivership was the only means of compelling the bondholders at their expense to furnish the money necessary for bringing the plant and equipment up to a proper efficiency. In this evolution of the receivership idea we have practically put aside the old theory that a railroad mortgage was what its language represented it to be—a lien on the property, absolutely the first under all circumstances.

In the nature of the case this conception of a railroad mortgage was not correct. The English theory is nearer the truth. In Great Britain, since the famous decision of the House of Lords, bonds are liens on the income only and cannot be foreclosed. So too are railroad bonds in United States, in practical working, for the right of way and tracks, considered as real estate, are never worth the mortgage; the real security is the earnings of the company as a transporter of traffic. If for any cause—such as depreciation in the physical condition—this earning power is impaired, the value of the bonds is lessened; the appointment of receivers who shall make up that depreciation at the expense of the mortgage interest is only another way of acknowledging the commercial fact, no matter what the provisions of the mortgage may be. Nor have we yet seen the end of the matter. No portion of our commercial law is changing so rapidly as the law of receiverships. What is disapproved by one judge to-day is considered proper and legal in another court to-morrow.

As previously remarked we have now reached the stage of representation. The evolution of the receivership has carried us along until such vast power to help one interest or damage another is lodged in our courts and their appointees that the preliminary struggle for the position often settles in advance the approximate amount of money or value which a particular interest may be expected to gain or suffer. Of course, eventually commercial conditions must govern, but before these laws work themselves out it is possible so to arrange matters that one set of creditors will appear to secure some advantage, which may allow the knowing ones to sell out in the street before the later crash comes in sight.

In the New York & New England case the appointment to the receivership is important because no one can easily foresee what turn affairs will take. The wild plan of a connection to New York City will be abandoned. Will the receivers give up through traffic as did Mr. Clark in 1884, and devote themselves to nursing the local business? Will they make war on the New Haven; or contrariwise, will they allow the policy of that powerful company to dominate the New England also? Much depends on the receivers and on the interests which they represent. Hence, as before suggested, the importance of the appointments, from a strategic point of view. The whole matter, however, serves to bring into clear light the great departure from the original conception of a receivership. Such a change was, no doubt, inevitable because the legal language of mortgages and the commercial conditions and public duties under which railroads are operated; nor can we say on the whole that the new practice has worked substantial injustice. It puts new and grave responsibility upon the judges of our higher courts; but we have always relied upon an uncorrupt judiciary, and hitherto not in vain.

Cable versus Electric Motive Power for Street Railroads.

In the *Polytechnic* of the last quarter, Mr. G. Leverich compares cable and electric motive power for street railroads, and asks upon what ground the management of the principal street railroads in Brooklyn decided to choose electric instead of cable power. The comparison made by Mr. Leverich is favorable to the cable system, and the conclusion is reached that, "excepting in one item, the electric is not superior to the cable power for large traffic on street railroads, and that in this item, if the two railroads compared are alike in their important features, the first may cost nearly as much as the latter." The item referred to is given in the following: "The wiring system, including the supports and connections from the plants to the cars on the tracks, will generally cost less at first than the cable, their pulleys and the conduits which contain them." The important feature mentioned which, if alike in the two systems, would bring the relative costs nearer together, is explained in the following: "If the conducting wires were put in conduits, as they should be, the difference in this item between the two motive powers would be much diminished and possibly might disappear."

As a comparison of the trolley and cable systems of propelling street cars we think Mr. Leverich does not give due weight to all the points, though under the limited conditions of the thickly settled portions of the city of Brooklyn he is undoubtedly right. We have found by several careful estimates that the cost of operation and of construction of a *conduit* electric system and a cable system, where the traffic is heavy, is about equal; but if, as in Brooklyn, the overhead trolley is permitted, the cost of construction, everything included, as well as the cost of maintenance, is, at the present time, less for the electric than for the cable system, and this is independent of the nature of the traffic, whether heavy or light. So far as operating expenses are concerned, the cost is practically the same with either system when the traffic is very heavy. The Brooklyn street railroads, even in the thickly settled districts, could only reach one conclusion so long as the grades are reasonable. The lower cost of the trolley, even for the thickly settled districts, would give it the preference. Probably if a conduit electric system had been demanded by the Brooklyn city government, the roads in the thickly settled portion would now be operated with a cable, not only because there would be no saving in the first cost by using the conduit electric system, but further for the reason that the electric conduit system has been "side-tracked" by the electric companies; it has been purposely kept in the stage of experiment so that no one can now adopt it without a feeling of some distrust as to its operation.

In the outlying districts of Brooklyn, where traffic is light, there is no chance for choice in selecting a system of propulsion. If the trolley is permitted the advantage is all one way, and very decidedly so. The cost of operation and the first cost are so much less with the trolley that capitalists never hesitate in choosing between the two. Before the advent of the trolley system and long after the cable system had been proved to be a practical means of propelling street cars, transit in outlying towns and villages was carried on by means of horse cars and omnibuses. Since the coming of the trolley system, the transit facilities have been increased many hundred-fold, and the trolley is everywhere conferring a blessing on humanity, in spite of the fact that reckless running has in some cities resulted in many deaths and injuries. With no other system but the trolley would it have been possible to give the splendid facilities of transportation now common in most suburban districts in this country. The unsightliness of the overhead wires, the interference with the fire departments, the increase of insurance, together with all the other disadvantages arising from the trolley system, are after all very small when compared with the blessings it has conferred on humanity. The fact that it has found its way into the far Western villages and has increased the business and prosperity of many country towns, is evidence of its advantages over every other system of propulsion known.

What is it that has induced capitalists to select in almost every instance the trolley in preference to the cable, leaving aside horses as wholly out of the question and the conduit electric system as undeveloped?

The central station of the trolley system can be located almost anywhere in a city, and therefore a cheap site, with water for the condensing engines, can usually be found. If the distance from the line of the road is considerable there will be a slight increase in cost of the conductors for feeding the line, but this increase is immaterial compared with the cost of the whole plant, and is, generally, more than compensated for by the saving in the cost of the site and from using condensing engines. With the cable the power-house must be located somewhere near the middle of a comparatively short section of road and must be pretty close to the line of the road. With the trolley system only about one-half or one-third as many central stations are needed to supply the power, as the current can be conveyed a longer distance than it is practicable to run a cable from a station.

The cost of a cable road, for the roadbed and conduit alone, has been found to run from $80,000 to $120,000 a mile. The cost of a trolley system is not more than one-sixth of this. The speed of a cable car is fixed by the speed of the cable, which is a decided disadvantage in outlying districts, where it is often perfectly safe to run cars at a much higher speed than a cable has ever been operated. The faster the cable runs the quicker it wears out. The life of a cable does not average much above 250 days, and with this short life cables are not run after 1 o'clock at night. The power required to run a cable alone without any cars is great. Some of the cables in Chicago require above 300 H. P. to keep them in motion, and it is only when a considerable number of cars have been put on that there is apparently any increase in power demanded at the central station. It is this large constant loss of power which compels the cable companies to shut down their lines and use horses after midnight. With the electric trolley system there is practically no power required except when cars are running. The loss due to leakage is so small that it is not worthy of being taken into account. Electric cars are therefore run all night, which is a great convenience in a large city. In Chicago the elevated railroads get all the night business where they run near cable lines, for the reason that people will not ride in horse cars over long distances. It is much cheaper to operate an elevated (steam) railroad at night than to operate a cable road, but with the trolley it is even cheaper to operate at night than to use horses, for the reason that power is only used for useful work, and when no cars are running practically no current is demanded from the central station.

In the case of a break-down on a cable line there is a long delay. If there be a broken grip, the car cannot be moved generally until the grip is hoisted out by the relief wagon sent from the central station, but with the trolley system if a motor fails the car can be pushed in at once by the car following, and there is is little delay. If the cable becomes stranded or broken the delay averages about four hours in Chicago, and for this defect and loss there is no parallel in the trolley system. The trolley wires seldom fail.

Mr. Leverich is right in saying that speed of electric cars should be regulated, and that the conduit system should be demanded in thickly settled districts; but there should be no difficulty in finding out the reasons why the "management of the principal street railroads in Brooklyn determined to substitute electric for horse power" instead of using the cable. The experience on Broadway, New York, is not the most gratifying, yet every one will admit that rapid transit facilities have been much increased since that cable was started. But it is not evident that Broadway is any safer for the public than it would be if the conduit electric system was used, or that there are less delays than there would be with that system, though the fact that the gripmen on the cable line are directed not to slacken hold of the cable in passing around curves, results in some pretty reckless running at Union Square; a conduit electric system would be safer in this respect.

Mr. Leverich says, "The design and construction of cable railroads often is put in charge of managers unfamiliar with this special department of engineering." We do not know what roads are referred to, but the general experience is that it requires a long period after cable roads are started before they are safely and uniformly operated, but this may be due as much to the newness of things and to the new conditions as it is to the change in designs and devices. The cable and grips work pretty nearly up to their limit of strength a good many times daily, and it is not to be wondered at that so many breakages occur in spite of the rigid inspection that is given to the grips at the end of each trip, and to the cable every day after working hours. It has been said, with some appearance of probability, that whenever all of the cars, or a majority of them, on any one section of the Chicago cables are started simultaneously from rest, the cables always break, and must break, owing to the enormous total inertia of the cars.

Mr. Leverich says that the track for the electric road must be as heavy and as strong as for a well constructed steam railroad; while for the cable that of an an ordinary horse railroad will serve. This does not appear to be the practice of cable-road builders. As heavy tracks are used for cable as for electric roads. The heavy track of a street railroad is not made because of the heavy weights of the cars or motors, but in order to permit the maintenance of a smooth, easy riding track for the comfort of the passengers.

In conclusion it is probably safe to say that the cable railroad, for street service where the grades are reasonable, has a limited field, confined mostly to heavy traffic in thickly settled districts, while the trolley system is applicable to both heavy and light traffic, and the peculiar limitation of its use is confined to the safety of pedestrians and the disfigurement of the streets. Devices have been proposed for limiting the speed of trolley cars by disconnecting the electric switches when a maximum speed is reached. If these are found successful they ought to cure some of the difficulties, and it does not seem reasonable to suppose that the other dangers, those due to the recklessness or inexperience of motormen, cannot be cured whenever a determined attempt shall be made to cure them. With this point settled, the only entire limitation of the usefulness of the trolley, so far as can now be seen, will be found in the unsightly overhead wires and poles. When the conduit electric system is developed, as it now promises to be, the electric companies having at last decided to give it a chance, the days of the cable road may therefore be numbered; where the trolley system is objectionable the conduit system will be substituted and the same cars can be run over both the conduit and trolley sections of the line without delay in transfer.

United States Railroad Traffic and Income in 1892-93.

The Interstate Commerce Commission has issued a preliminary report on the income account of the railroads of the country for the year ending with June last—many months earlier than the publication of the full report, if that be no earlier than usual. It was by all means desirable that the statistics of our railroads should be published as early as possible, as their value decreases very rapidly with their age; and incompleteness is a much less serious objection. The statistics are certainly incomplete; for the preliminary report covers only 145,870 miles of railroad, while the full report for the previous year included 161,275 miles, and about 4,000 miles of new road had been added since. There must have been, therefore, nearly 20,000 miles of railroad which had not reported in time to be included in this preliminary report, or down to Dec. 1 last, which seems inexcusable.

Of course comparisons of this incomplete report with the complete reports of previous years have little significance, and the preliminary report does not give the figures of the roads for any year but 1892-1893, with the exception of their net earnings.

A very brief table will contain the statistics given for the aggregate of the 145,870 miles reporting.

UNITED STATES RAILROADS IN 1892-3.

Traffic:	Total.	Per mile
Passenger-miles	12,825,975,314	87,928
Ton-miles	84,997,043,814	582,692
Earnings:		
Passenger	$322,805,538	$2.213
Freight	739,249,365	5,068
Other	23,566,347	162
Unclassified	64,031	....
Total	$1,085,685,281	$7,443
Working expenses	735,427,532	5,042
Net earnings	$350,257,749	$2,401

That is all. The report gives corresponding figures per mile for the entire railroad system of previous years, but a comparison of the last year's figures with these will be misleading unless the 20,000 miles of railroad not yet reported for last year have the same average earnings, etc., as the 145,870 miles reported, and they may be quite different. In our experience the laggards in reporting are usually poor roads, but they may not be in this case.

The traffic reported for 1892-93 is equivalent to a movement of 120½ passengers and 798 tons of freight each way daily over the entire 145,870 miles. For the entire system in previous years the corresponding movement has been:

	1891-92.	1890-91.	1889-90.	1888-89.
Passengers	113	109	104	103
Tons freight	744	689	667	614

If the traffic movement on the lines not included in the preliminary report was as dense as on those included, the total passenger movement was 15,227 millions of passenger-miles, and the total freight movement 100,956 millions of ton-miles last year, while the totals in previous years have been:

Millions of—	1891-92.	1890-91.	1889-90.	1888-89
Passenger-miles	13,363	12,844	11,843	11,554
Ton-miles	88,241	81,071	76,207	68,727

Thus, assuming the preliminary report to represent only the average density of traffic, we should have an increase of 1,864 millions of passenger-miles from 1892 to 1893, against an average increase of 603 millions per year for the three years previous; and an increase of 12,715 millions of ton-miles from 1892 to 1893, against an average yearly increase of 6,505 millions from 1889 to 1892. That there was such an extraordinary growth of traffic last year is extremely improbable. Therefore, the earnings and expenses per mile of the earlier years, given below, may not fairly be compared with those of the preliminary report for 1893, above.

Earnings per mile:	1891-92.	1890-91.	1889-90.	1888-89.
Passenger	$2,104	$1,962	$1,978	$1,956
Freight	4,946	4,689	4,589	4,204
Other	163	150	158	160
Total	$7,213	$6,801	$6,725	$6,320
Expenses	4,809	4,538	4,425	4,203
Net earnings	$2,404	$2,263	$2,300	$2,087

The preliminary report also gives the dividends of the roads covered by it, amounting to $66,652,400, or $457 per mile, which is $1,963,713, or 3 per cent., more than the dividends *of the same roads* in 1891-92.

These few figures, it must be remembered, are given not only for the whole railroad system, but for each of the ten groups into which the Commission has divided the system, and for every separate road reporting, 479 in number. Probably it is early enough to have some value for investors in certain railroad companies which persistently avoid letting the owners know how much business is done on their property. The figures for groups are not of much importance in this preliminary report, because the earnings of a company which has lines in more than one group are not always divided as they will be in the final report, and so comparisons with previous years may be still more defective than in the case of the whole system. The New England group is said to be substantially complete, however, and it shows an important gain in net earnings over 1892, as follows:

	1892-93.	1891-92.	Increase.	P.c.
Net earnings	$23,873,843	$21,042,710	$2,831,133	13.5

For the whole number of roads reporting, compared with the *same roads* the previous year, the net earnings were $9,775,000, or 3½ per cent. greater. Their increase in mileage was probably inconsiderable, but in capital greater, as improvements and additions to equipment are considerable in all but very bad years, and in the year in question were unusually great on many railroads.

The publication of an early report is much to be commended. It would, however, be very much more valuable were all totals (of groups and the country) given for at least one year previous for the aggregate of the roads reporting, to make comparisons possible. This would add greatly to the labor of preparing the report, it is true. Comparisons of any one road, of course, can be made by reference to the figures in the previous year's report.

World's Fair Travel Again.

We discussed in the *Railroad Gazette* of Jan. 19 the effect of the Chicago World's Fair on railroad earnings, as illustrated by the monthly reports of the Chicago, Burlington & Quincy, which indicated not only the important gain to the railroads by the Fair travel, bu the extremely bad condition of general business since May, as shown by the great reduction in freight earnings.

We now give the passenger earnings of four other important railroads for the six months of the Fair, some of which show still more important gains than those of the Burlington, and have a similar significance in the light they throw on the business situation at the time. The figures are below.

Passenger Earnings, May 1 to Oct. 31.

	1893.	1892.	Increase.	P. c.
C., B. & Q.	$6,141,415	$4,935,552	$1,205,863	24.4
A., T. & S. F.	3,540,282	2,889,365	650,917	22.5
Wabash	2,743,613	1,901,335	842,278	44.3
Mich. Cen.	4,246,516	2,525,297	1,721,219	68.1
N. Y. Cen.	6,689,119	5,906,210	782,909	13.1
The five roads	$23,360,945	$18,157,759	$5,203,186	28.7

The Atchison might be considered roughly as a system parallel to the Chicago, Burlington & Quincy; that is, it has a line from Chicago to Kansas City and a great system west of the Missouri. But the contrast between the two systems is great. The Burlington has a great system in the thickly peopled states of Illinois and Iowa, where its lines are old; the Atchison's system proper is west of the Missouri with simply an outlet to Chicago over a new line which passes through few large towns. The difference is shown particularly in passenger traffic, for the 6,800 miles of the Burlington in half of a normal year like 1892 yielded $2,046,000 (70 per cent.) more passenger earnings than the 7,480 miles of the Atchison. And so the gain from the

World's Fair travel was 85 per cent. greater on the Burlington than on the Atchison, whose percentage of gain, nevertheless, was remarkable, considering that all but a small part of its system is more than 500 miles from Chicago, and largely in a country supposed to have been poverty-stricken last summer.

The Wabash is, as to Chicago, both an Eastern and a Western line, its recently opened line to Detroit, and its old line to Toledo, giving it access to the through Eastern travel and important local travel in Ohio, Michigan and Indiana. It has no great mileage in new country like the Atchison and the Burlington, and its passenger earnings per mile in the 1892 half-year were $1,011, against $725 on the Burlington and $386 on the Atchison. A very large proportion of its mileage—in fact, nearly all of it—is within 500 miles of Chicago, so as to be most susceptible to the stimulation of the World's Fair. But the increase in passenger earnings after all seems astonishingly great, being more than 44 per cent. and $435 per mile, against 24 per cent. and $177 per mile on the Burlington.

The Michigan Central is an Eastern line, wholly in a populous country and one of the chief trunk-line connections with Chicago, and nearly all within 500 miles of Chicago. Its gain in passenger earnings during the fair is astonishing—no less than 68 per cent., and in amount two-fifths greater on its 1,640 miles than on the 7,822 of the Burlington, the gain amounting to no less than $1,050 per mile of road for the six months, which is just about equal to the average *total* passenger earnings per mile of the railroads of this country in an ordinary half-year.

We now come to the New York Central, which has on its lines a greater population than any other railroad of the country, is the chief connection between New England and Chicago, and has more through travel than any other trunk line, but whose whole system is more than 500 miles from Chicago. The increase in passenger earnings on its 2,334 miles of road was not half as great as on the 1,640 miles of the Michigan Central, while its increase in earnings per mile of road, $335, was just $100 less than on the Wabash system—striking evidence that such attractions as world's fairs act inversely as to their distance. The smallness of its percentage of increase (13 per cent.) is not specially significant, being due chiefly to the fact that its ordinary passenger earnings are enormous.

As to the conclusions to be drawn on the condition of freight traffic during this period, we may observe that the New York Central had a decrease in earnings of $219,880 in the last half of 1893, during four months of which it had an increase of $504,666 in passenger earnings; the Michigan Central in the whole year gained but $166,700 in total earnings, in spite of the gain of $1,721,000 in passenger earnings during the World's Fair; the Wabash's total gain for the year is $418,500, or $424,000 less than its gain in passenger earnings in six months, and the Atchison has a loss of $918,000 in total earnings for the year to set against the gain of $651,000 in passenger earnings during the Fair. All of which emphasizes the conclusion which we drew from the study of the Burlington freight earnings, that general traffic after June was very much worse than was indicated by the reports of railroad earnings; that the World's Fair travel came just in time to save many of the railroads from very serious losses, and that now, when that travel has ceased, very considerable decreases in earnings are entirely compatible with an improving condition of business, compared with the past fall and summer.

Bond Market for January.

During the month the market for railroad bonds was rather more active than during December as compared with the stock market. It will be remembered that last month it had a downward tendency and in a number of groups scored material decreases.

Without an exception the average of the eight groups this month showed advances, ranging from 1.47 in the Southwestern to .45 in the Receivership group.

The general causes which have contributed to this strength are to be found in the money market. There is a steady accumulation of funds in commercial centers, and capital is receiving no call from commercial enterprises. The market for stocks, owing to well known conditions, is narrow, hesitating and professional. The bond market alone furnishes a field for investment. Now that the feeling is settling down that the worst is known in the railroad world, and that no more receiverships of importance are probable, it is something of a mystery to investment brokers why so much money is allowed to remain idle in the banks when it can be used to purchase on a 4 per cent. basis gilt edged railroad bonds on which the security is almost absolute. The last bank statement showed the surplus reserve to be $109,043,000. The attitude of the savings banks toward the bond market has been a passive one, owing to two causes, viz.: the pending government issue, and a desire to wait until there is some positive assurance of a revival in business, which, it is generally conceded, will not come until after the tariff issue has been disposed of. Secretary Carlisle's $50,000,000 bond issue is meeting with a somewhat chilly reception at the hands of New York bankers. London is waiting for the settlement of our two great national issues, viz, the tariff and relief of the country's semi-bankrupt treasury. When these questions are out of the way it is expected to be a heavy buyer of both railroad stocks and bonds.

In a general way it can be said that the bond market is very firm, and that good issues are scarce, and that the demand is extending, although in a more or less discriminating manner, to issues of the second and third grades.

The change by groups is given following:

Roads in receivers' hands	+ .45
Grangers	+ .93
Trunk lines	+ .72
Southwestern	+ 1.47
Transcontinental	+ .56
Coal roads	+ 1.03
Southern	+ .75
Miscellaneous	+ .78

The period of reorganization has hardly been entered upon, and until it is under way it is probable that the bonds of the Receivership group will show very light changes. The one great issue which is to come before security holders in most of these reorganizations is whether the stocks or the bonds are to bear the burden. St. Louis & San Francisco seconds were strong, probably upon some favorable news in regard to the reorganization of the Atchison. They are sure of their interest. Louisville, Evansville & St. Louis declined 19½ points on the receivership. The weakness in Northern Pacific bonds, noted a month ago, continues on further unfavorable developments in regard to the affairs of the company, which have been set forth in these columns, and the foreign liquidation. Reading & Richmond Terminal have shown some little strength. Oregon Short line 6's advanced 11 points upon the application for the payment of back interest; while Fort Worth & Denver City firsts advanced 7 points on the payment of back coupons.

The various granger issues did not show a decline and can be said to reflect a feeling that the worst has been realized in the business depression. There was an excellent investment demand in these issues, and on the whole they are regarded more highly perhaps than any of the other issues except the trunk lines.

The Southwestern group led in point of average advance. The change was due to a more favorable condition of the South, and especially of that part thereof tributary to Texas & Pacific and the Wabash. These securities were depressed so as to fully discount the situation, and any improvement should be quickly reflected.

In the miscellaneous group Hocking Valley was weak on liquidation, and Louisville, New Albany & Chicago 4's were strong upon a better showing of earnings.

	Range for January. Highest.	Lowest.	Last sale.	Change from last sale in December.
Roads in Hands of Receivers:				
Atchison, Topeka & S. Fe 4s	70⅝	67	70½	+ 2½
" " " 2ds	34½	31½	34	+ 2½
Colorado & Midland 4s	32	29	30	.....
Atlantic & Pacific 4s	48⅛	45⅛	45⅛	— ⅞
St. L. & S. F. 2ds A	106⅝	101	106⅞	+ 6⅜
" " 2ds B	106⅝	101	106⅞	+ 6
" " 2ds C	107	101	107	+ 6½
" " gen. 4s	43⅛	37	43⅛	+ 3½
" " " 5s	73	70	73	— 4
" " " 6s	90	82	89	— 5
Cleve., Canton & So. 1sts	83	80	83	+ 3
East Tennessee 5s	93	86½	88¼	— 1¼
Erie 2ds	78¼	74½	77	+ 2½
" funded 5s	70	69¾	70	— 4½
Lou., Ev., St. L. 1sts	50	42	42	—19½
Lou., St. L. & Tex. 1sts	57	55½	57	— 3
Northern Pacific 1sts	110	105¾	110	.....
" " 2ds	82½	76	82½	— 6½
" " 3ds	60¼	52½	58½	— 7½
" " 5s	30½	26¼	28	— ¾
Northern Pac. & Mon. 1sts	32	31	32	+ 2
Chicago & N. Pac. 5s	49	43	48⅜	+ 5⅜
Peoria, Dec. & Evan. 1sts	80	72	77	— 3
" " 2ds	25	19	24	— ½
Reading 4s	71½	67½	71⅜	+ 2⅞
" 1sts	34¾	31	33½	+ 3½
" 2ds	24½	20	23¾	+ 4½
" 3ds	20	16½	18¾	+ 3¾
Rich. & W. P. T. 5s	19¾	18	19	+ 1¾
" " 6s	46⅛	40	45	+ 5
Rich. & Danville 1sts	108	106½	108	— 1½
" " 5s	67	65	67	+ 2
Union Pacific 1sts, '96	103½	101	103½	+ ½
" " 1sts, '97	103⅜	101	103¾	— ¼
" " '98	105	102	105	.....
" " '99	105¾	105	105¾	— ⅛
" " gold notes 6s	82½	82	82½	— 5½
" " sink. fund 8s	100	95½	100	+ 2
" " Col. Tr. 6s	76	70	76	— 1
Ore. Nav. 1st 6s	103⅛	104½	108	+ 4
" con. 5s	67	60	67	+ 2
Kan. Pac. 1st con. 6s	85½	80	85	— 2¾
Ore. Short L & U. N. con	51¼	48	51¼	+ 2¼
Ore. Short Line 6s	87	75	86	+11
Atch., Col. & Pac. 1sts	46	40	44½	+ 4½
U. P., D. & G. 1sts	45¼	42	45	— 3
Ft. Worth & Den. City 1sts	74⅜	66	74	+ 7
W. N. Y. & Penn. 1sts	101¼	98¼	98¾	— 3¼
" " " 2ds	22	19¾	20¾	.....
Average advance, .45.				
Grangers:				
Chic., Burl. & Q. conv. 5s	102	101⅛	101⅞	+ ⅞
" " " 7s	120½	119	120⅝	+ 1⅜
" " " deb. 5s	98	97½	97½	+ ½
" " " Neb. div. 4s	87	85½	87	+ ½
" " " 1sts	125	123	125	+ 3½
" " " deb. 5s	93¼	92¼	93½	+ 1¼
" " " ex. 5s	99½	97¼	99¼	+ 1¾
St. Paul, 1st 8s	119	116½	118½	+ 1½
" " cons. 7s	127½	127	127	+ 1½
" " gen. 4s	90¼	90	90⅛	— ⅛
" " Chi. & P. West. 1st 5s	107⅝	107	107¾	+ ¾
" " South Minn. div	113¼	111¾	113⅛	.....
" " Southwest div	113	112	113	— ⅛
Northwest S. F. 5s	109	108	108½	+ 1
" con. 7s	139¾	138	139¾	+ 1¾
" 25 yr. deb	108	104	105	+ ¼
" 30 " "	107¼	107	107¼	.....
" gold bonds	122½	121½	121½	+ ¼
Average advance, .93.				
Trunk Lines:				
Pennsylvania 4½s	106½	105	106½	— 1¼
P., C. C. & St. L. 4½s a	102	100½	102	+ ½
Lake Shore 1st 7s	119	118	119	+ ½
" 2d 7s	123	122	123	+ ⅛
Mich. Cent. 1st 7s	123¼	122¼	122½	.....
" " 5s 1921	113⅛	111¼	113⅛	+ 2
N. Y., Chic. & St. L. 4s	98⅜	97¼	98¼	+ ¾
N. Y. Central 1st 7s	125	123	124⅜	+ 2⅜
Beech Creek 1sts	100½	99½	100⅜	+ ¼
Rome, Wat. & O. ex. 5s	114½	113¼	114½	+ ⅝
N. Y. & Harlem 1st	119	116¾	119	+ 2
West Shore 4s	102½	100½	102½	+ ½
Average advance, .72.				
Southwestern:				
Int. & Great Northern 1sts	111	110⅜	110½	.....
Kan. & Texas 4s	80	78	79¼	+ 1¼
" " " 2ds	47½	44	46	+ 2
Missouri Pacific 3ds	105	103	103	— 2½
Iron Mountain 1sts	103	102	102¾	+ ¼
" " 2ds	105	102	104½	+ 1½
" " 5s	73	71	73	+ 1
Pac. of Mo. 1sts	99¾	95	99¾	+ 4¾
" " " 2ds	100	99	100	— ⅛
St. Louis Southwestern, 1sts	58¼	55⅝	57½	+ 1
" " " 2ds	19½	16¼	19	+ 3
Texas Pacific 1sts	76⅞	72¾	76½	+ 3¼
" " 2ds	21¾	17½	21½	+ 3¼
Wabash 1sts	103½	102	103¼	+ ¾
" 2ds	75¾	72½	75½	+ 3¼
Average advance, 1.47.				
Transcontinental:				
St. Paul, M. & M. cons. 6s	116½	115	116¼	— ¾
" " " " " " 4½s	99¼	97½	99¼	+ ½
" " Mon. Cen. 5s	98	97	98	.....
" " Mon. ex. 4s	84½	84	84½	+ 2½
Average advance, .56.				
Coalers:				
Jersey Central gen. 5s	111¾	110½	111¾	+ 1¼
Lehigh & Wilk. con. assnd	107	105	107	+ ¾
N. Y., Ont. & W. 4s	84	82¼	84	+ 1½
" " " " " con. 5s	108⅜	107	108⅛	+ ⅝
Average advance, 1.03.				
Southern:				
Lou. & Nash. gen. 6s	112	109¼	112	+ 2
" " " gold 4s	74	72½	73	.....
" " " Penn. Div. 6s	108	105½	108	+ 4
" " " N. O. & M. 1st 6s	114½	113½	114¼	— 1¾
Average advance, .75.				
Miscellaneous:				
American Cotton Oil 8s	113⅛	112	113½	+ 2⅛
Alabama Mid. 1sts	85	83	85	+ 2
Am. Dock & Imp. 1sts	109	108½	109	+ ⅛
Buff., R. & P. gen. 5s	99	98	98½	— ½
Bur., C. R. & N. 1sts	104	102	104	+ 2¾
Brook. Elevated 1sts	104½	100	103¾	+ 3¾
Ches. & O. con. 5s	103¾	101¼	103¾	+ 2
" " gen. 4½s	75	72	75	+ 3⅛
" " R. & A. 1sts	85½	84¼	85½	+ 1
Cinn., D. & Iron 1sts	96	94	95½	+ 1⅜
Can. South. 1sts	108	105½	108	+ 1½
" " 2ds	103½	102	103½	+ ½
Chi. & E. Ill. 1sts	113½	111⅜	113¼	— 1
" " gen. 5s	99	97¾	98½	— ¼
Chi., G. L. & C. Co. 1sts	87	85¾	85¾	.....
Denver & R. G. 4s	77½	75	77	+ ½
Det., M. & M. L. S.	24	23	23	— 3
Eliz., L. & B. S. 1sts	99	96	99	+ 1
Edi. Elec. Ill. 1sts	105	102½	105	+ 2¼
General Electric deb	73½	68	73	+ 2
Hock. Val. 5s	89⅞	86½	89¾	+ 1¼
" " 6s	90	87	88	— 5½
Hous. & Tex. Cen. 1sts	102½	101	102½	— 1
" " " " 4s	63	60	63	— 2
Iowa Central 1sts	88	86	87½	+ 1½
Laclede Gas 1sts	85	81	85	+ 5
Lake Erie & W. 1sts	111½	110½	111	+ ⅛
L., N. A. & C. con. 6s	95½	93	95	— ½
" " " " gen. 4s	67	62	67	+ 7
Mor. & Essex 1sts	140	138½	140	+ 2
Met. Elev. 1sts	118	116	118	+ 1½
" " 2ds	108	107	107½	+ ¼
Mobile & Ohio gen. 4s	59¾	57⅞	59	+ ⅛
M., L. S. & W. 1st 7s	125	124	125	— ½
N. Y. Elevated 1sts	110½	109¾	110¼	+ ⅛
Ohio & Miss. 2ds	116	114	116	+ 3
Or. Improvement 1sts	97¾	92½	97½	— ⅞
" " 5s	51½	46	50⅞	+ 1⅞
Peo. & Eastern 1sts	72⅞	71	72	— 1
Pitts. & Western 1sts	84	83	84	— ¾
Rio. G. West. 1sts	70	68½	69⅝	+ 2⅝
San. A. & A. P. 1sts	56	50½	54½	— 2
Third Ave. 1sts	112½	111	112½	+ 1½
Ulster & Del. 1st 5s	100	99	99½	— 1⅝
Union Elevated 1sts	95½	94	94½	+ ½
W. U. Col. 5s	104½	103½	103⅞	— ⅝
Average advance, .78.				

The New Hudson River Bridge Bill.

A new bill for bridging the Hudson is now before Congress. It authorizes the New York & New Jersey Bridge Company to construct, operate and maintain a bridge across the Hudson River subject to the laws of the States of New York and New Jersey upon the following conditions: The location of the bridge is to be subject to the approval of the Secretary of War; the structure to be located between Sixty-sixth street and Seventy-first street, New York City. The company is to construct and maintain such bridge for the use of all railroads on both sides of the river. They are to be permitted to connect with said bridge and approaches, and have equal rights upon equal and equitable terms. All disputes arising are to be decided by the Secretary of War. The Sinking Fund Commissioners of the City of New York are given power to locate the approaches and to determine what roads shall be operated upon them. The Secretary of War must approve of the elevation of the bridge, which shall not be less than 150 ft., as well as all the plans and specifications. An attempt

has been made to meet the objections of the President to the pier in the river by providing that the President shall appoint a board consisting of five disinterested, expert bridge engineers, of whom one shall be the Chief Engineer of the War Department and the others from civil life; this board to investigate and determine, by a majority, what length of span, not less than 2,000 ft., is safe and practicable for a railroad bridge over the said river, such decision to be filed with the Secretary of War. The compensation of said board to be fixed by the Secretary of War and paid by the bridge company. The bill provides also that the companies shall operate and maintain the bridge at their own expense, provide light and signals, and that mails and troops of the United States shall be transported free of charge. It is further provided that the company shall not charge a higher rate of toll than is authorized by the laws of New York or New Jersey; that it shall be subject to the Interstate Commerce law and its amendments, and that the bridge shall be a lawful military and post road. Acceptance of the terms of the act must be filed and the bridge begun within one year after its passage, and the bridge be completed within 10 years.

It is folly for engineers to talk of constructing a bridge over the river without a pier. The span of the East River Bridge is 1,596 ft., and the greatest span yet built is that of the Forth Bridge, which is 1,710 ft. To erect a bridge without a pier in the river will require a span of from 3,000 to 3,300 ft., nearly double that of the Forth Bridge, a task which a conservative and reasonably careful engineer would never undertake. To erect a bridge of 2,000 ft. span, even—a plan which involves a pier near the Jersey shore and which was rejected by President Cleveland—will tax the constructive ability of the day, and it would tax the financial resources available for such a project very much greater. No practical, well-informed bridge engineer would undertake to erect a 3,300-ft. span bridge with any degree of certainty as to its results; though there *are* engineers who would undertake to fly across, and others who would tunnel, the Atlantic, and there are other engineers who would consider not only the theoretical possibility of such a thing, but the practicability and business side of the adventure as well. Such a single span bridge, if erected, would be but a stupendous scheme in which to sink millions of money before it was completed, and its utility for the transportation of railroad trains might well be doubted after it was erected. The Hudson River tunnel is an illustration of this blind way of going into great engineering enterprises. It may well be characterized as a dead letter, and whether due to adverse influences, to a misconception of the difficulties to be overcome or to the lack of interest in the project on the part of the railroads who might utilize it, the fact is there, that the tunnel company has exhausted all its resources and present credit in the construction of about three-fourths of one-half of the projected tunnels. No approaches have been provided for and the work has now lain hopelessly idle for nearly a year with little chance for its immediate renewal. Any one who wishes to test the sincerity and confidence of any engineer in the project of erecting a single span bridge across the Hudson River should invite him to invest his bottom dollar in the scheme. The facts are that nobody but extreme enthusiasts ever expect or hope to see a single span structure between bulk head lines, and the only hope of the bridge company is in a report by the board of expert engineers favoring a pier in the river. The only objection to the pier is that it will obstruct commerce, meaning thereby the tugboat and ferry interests of the river. This objection is presented without a thought of the obstruction that the river itself is to the great volume of traffic that now has to be ferried across it.

Traveling Engineers' Association.

No more worthy object of an organization of railroad employees can be stated than that which is expressed in the motto of the Traveling Engineers' Association, viz., "To improve the locomotive engine service of American railroads." Those who have tried to institute needed reforms in locomotive operation have frequently been hindered by the apathy and occasional contrariness of locomotive runners, and have often wished that engineers were more tractable. To a large extent the traveling engineer is responsible for the attitude of engineers and firemen toward the management. If the traveling engineer is a broadminded and companionable fellow, who thoroughly understands the plan of the management and is in harmony therewith, things generally go all right; but if he is a fellow without enthusiasm and is morose and secretly out of sympathy with the management on the one hand or with the engineers and firemen, on the other, things usually go wrong. The first duty of a traveling engineer is to inform himself of the policy of the management toward engineers and firemen and then if he is not in harmony with it, he should resign and clear out; but if he is in harmony, then he should study the ends to be reached and work up some enthusiasm and interest in the results hoped for, and get out among the men and infuse into them as much as possible of the enthusiasm he has and do his double duty, which is to make plain to the men what is wanted and to see that what is wanted is done. There is no more potent influence among engineers and firemen for good or for evil than that which is in the hands of the traveling engineer if he is a large enough man to wield it.

The first annual meeting of the Traveling Engineers' Association was held in Chicago last September. The report of the proceedings of that meeting has been printed in a neat pamphlet and is now ready for distribution to those who care to read it. Copies can be obtained from W. O. Thompson, Secretary, Elkhart, Ind. The proceedings contain much that is interesting and useful, not only to engineers and firemen, but also to operating officers. The Association has started well and has dealt with topics that are within its legitimate field; and, now that the purpose of the Association has become known, railroad officers formerly inclined to be unfriendly have entirely changed their attitude toward it.

An example of some of the interesting reading in the proceedings is the following from a discussion of the report of the Committee on Safe and Practical Air-Brake Service. One speaker having been asked how he managed to impress engineers with the bad effect that air-brakes, when applied suddenly, have upon the rear of the train, said:

"We had a very aggravating case at one time, where we took the engineer and put him in a caboose, and got the fireman to handle the brake just as the engineer had been handling it, placing the engineer's back toward the engine. The fireman made a gentle application and brought the speed down to four miles an hour, and when he wanted to stop threw the brake valve handle in the emergency position. If it hadn't been for the front door of the caboose the engineer might have been going yet. It was the best lesson he ever had. He wanted to hang the fireman, but when the trainmen told him that it was not quite as bad as his own work he changed his tactics."

When a railroad officer finds his traveling engineers administering such a practical lesson as this, he is bound to be satisfied with the earnestness and the enthusiasm exhibited. The report of the Committee on Economical Use of Oil and Supplies contains some interesting information, but has one defect, which is that it excuses delinquencies and neglect on the part of engineers and firemen, in the matter of saving oil, when the engines are not kept clean by the wipers. It is true, of course, that a clean engine is a good example, and engines should be kept clean for that reason, but nevertheless no engineer or fireman, nor any other employee, should be excused for neglect of duty because some other employee is negligent. The report reads as follows: "Engines that are never wiped or cleaned are not a very interesting subject on which to preach economy to engineers or firemen, for if the railroad companies do not interest themselves in the cleanliness of their engines, why should the officers expect the engineers and firemen to interest themselves in the economical use of oil and other supplies?"

The first year's work of the Association has shown that the object is a good one, and from the present attitude of master mechanics and other officers, it will no doubt prosper.

The Relation of Transportation to the Milling Interests was the subject of an address delivered before the Southwestern Millers' Association last week by Mr. A. J. Vanlandingham, Commissioner of the Kansas City Transportation Bureau. The speaker opened his remarks with some statistics of the wheat production of the states represented in the Association, showing that of the total wheat grown in the United States in 1892 Kansas produced 13.7 per cent. and Kansas, Missouri and Nebraska together produced 23.5 per cent. Kansas produced three million bushels more than the two Dakotas, and the three states first named produced 3⅛ million more than Minnesota and both Dakotas. Reference was then made to the high cost of transportation on turnpikes in the first part of this century, when flour was $1 a barrel from Columbia to Philadelphia, 75 miles, the turnpike receiving 1.35 cents per ton per mile for its share of the transportation charge. Turning from history to present conditions the speaker went on to show how ports as far off as Montreal have an effect on prices at Kansas City. It does not appear, however, that any Kansas City grain went to Montreal, and none went last year to Boston, even. More export flour from Kansas City went through New York than through all other ports combined. The new steamship line from Newport News is said to be the favorite route from Kansas City for export flour at present. Ships sailing from Charleston have lately taken flour from Kansas City, and Port Royal, S. C., has taken a little. Port Royal is 200 miles nearer Kansas City than is New York City. Galveston is only 805 miles distant, 76 miles nearer than New Orleans. The New Orleans route now governs the winter export trade from Kansas City, and Mr. Vanlandingham thinks that although Galveston will never be equal to New Orleans it will, if it gets the deep water in its harbor promised by the Government, hold the same relation to that city that Philadelphia does to New York. Kansas City could ship wheat to the City of Mexico very favorably if it were not for the import duty imposed by that country.

Mr. Vanlandingham, in the address referred to, advised his hearers to urge their state senators and representatives to let anti-railroad legislation alone until those railroads which are in the hands of Receivers shall have time to recover. This advice is especially important to Oklahoma, where the farmers want more railroads. Whatever state the hearer might hail from he was advised to oppose the bill now before Congress, the Paterson bill, for legalizing pooling arrangements between railroads. Mr. Vanlandingham sees no objection to repealing the 5th section of the law (which forbids pools) provided the railroads are left just where they stood before the law was adopted. As the railroads are already required to file all contracts with the Commission and as the Commission has authority to inquire into the business of all carriers, he thinks the control of the Government is sufficiently direct and definite al ready. But the proposition to fine the railroad companies instead of employees for violations of the law is approved, as well as the other features of the proposed law intended to strengthen the hands of the Interstate Commerce Commission. The speaker believes that if the railroads cannot secure the adoption of the bill as it now reads, they will be glad to accept it even if it makes no change in the existing law against pooling, as with the proposed law about penalties—fining the companies and abolishing imprisonment—they would have an effective means of punishing competitors who got the better of them by violating the law.

As if to emphasize the effect of the World's Fair on travel, the Chicago, Burlington & Quincy report of earnings for December shows a decrease of $150,391 (20⅛ per cent.) in passenger earnings, against increases in the previous seven months, as we showed two weeks ago as follows:

	Increase.	P. c.		Increase.	P. c.
May	$152,574	24.3	September	$122,543	11.9
June	234,656	33.2	October	381,007	42.9
July	189,622	23.7	November	118,458	16.7
August	125,462	14.2			

This was to be expected, but, added to the decrease in freight earnings, it leads many to suppose that the business condition of the country grew worse in December, while actually the decrease in freight earnings was less in December than in November or any other month since July. The percentage of decrease was 20.1 per cent. in December against 21.1 in November and 21.1 in October—practically the same in each of three months. But it shows that business was not growing worse, at least.

The act of opening the great hydraulic power plant at Niagara Falls, noted in our technical column, is an interesting event, and one that will attract the attention of the industrial world. But the greater event will be next summer, when the power will be converted into electricity and conducted across the country to other places. Nobody has doubted the practicability and success of the experiment just demonstrated, but many misgivings and doubts have been expressed about the success of the electrical experiment to be demonstrated in June. An example was recently reported in *The Electrical World* showing the feeling of the engineering fraternity across the water. The project and the methods employed by the company have raised a tempest among English electrical engineers. A paper read before the Institution of Electrical Engineers by Prof George Forbes (the promoter of the scheme), describing the method and plans of the company, provoked a tumultuous debate which was participated in by Professor Fleming, Sylvanus P. Thompson, Ferranti Siemens, Crompton and other well-known electricians. The sentiment was one of universal condemnation of the low frequency proposed for the alternating current, the methods of insulation by oil and the construction of the proposed conduit. Two men, Professor Fleming and Mr. Evershed, were in favor of the low frequency. Mr. Ferranti attacked the technical details of Professor Forbes' scheme in the most unqualified manner, devoting a good portion of the time allotted to him to a vigorous attack upon the methods pursued by the Cataract Construction Company in obtaining its information. The undertaking at Niagara would, he said, be carried out upon the "unrecompensed work of the whole electrical world," a sentiment that was greeted with unusual applause showing the feeling of English engineers toward the company for soliciting designs and plans, rejecting them all and the subsequent utilization of the suggestions and schemes obtained in making its designs and plans. Professor Forbes maintained his position with considerable spirit and expressed himself as well fortified in all his conclusions. A practical demonstration in June will be more satisfactory to all, and of course all Americans have the utmost confidence in its ultimate success.

No Sentiment on the B. & O.—Several times in the last few years ladies connected with the Woman's Christian Temperance Union have been instrumental in getting reinstated men who were discharged from the Baltimore & Ohio road for being intoxicated. Last week one of the kindly inclined ladies called upon President Mayer to get a man reinstated, and he gave her plainly to understand that the influence she had exerted in this direction would no longer be entertained. He had, he said, given strict orders that no employee who was discharged on account of the use of intoxicants should be reinstated, and any official who disobeyed his order in this matter would be promptly removed.

The foregoing item has appeared in several papers, and it ought to be true, whether it is or not; that is, as far as the order for the future conduct of the business is concerned. The statement that liquor drinkers have been reinstated because a kind-hearted woman asked it as a favor ought not to be true on any road: but where it is true, the other statement ought to be true

also. But we are not sure whether the heading is a truthful statement. It would be fairer to say that the Baltimore & Ohio is going to see that sentiment is kept in its proper place. To put into a responsible place on a train a man who is liable to befuddle his brain with alcohol is such a gross perversion of "sentiment" that it is a misuse of the word to employ it in such connection. Of real sentiment—a scrupulous and sympathetic regard for the personal welfare of individual employees—there is doubtless as much on the Baltimore & Ohio as on any other road. Judging from the various measures that have been adopted by the directors during the last 25 years for the benefit of employees, we should say that there is a good deal more of it than on most roads. But real sentiment, of the kind under consideration, has too high a regard for the employee to put him where he may make a blunder which will not only do great harm to others, but fill his own soul with remorse also. To give employment to an engineman, brakeman or switch tender who has been discharged or suspended for drinking, is generally a most laudable act; but that employment should be something where no serious harm can come to others in case the man falls again—say, sawing wood, cleaning out ash-pits, or clerical work.

In explaining the failure of the completed span of the Louisville bridge some weeks ago, it will be remembered that the Chief Engineer, Mr. J. S. Deans, contended that the collapse was due to a tornado, or tempest, of very short duration and limited extent, while the wind gage at the government station in Louisville registered only 24 to 36 miles an hour. This explanation did not find much favor, and, in fact, was generally discredited; but some new light is thrown upon it by recent observations at the New York State Weather Bureau, whose headquarters are at Cornell University. New apparatus obtained for meteorological investigations have enabled the Bureau to meet and solve many important questions. Among them is the determination not only of the mean horizontal force of the wind, but also its vertical components and the intensity of gusts. These instruments, already at work, show that with winds blowing at the rate of 15 and 20 miles an hour there are occasional gusts or blasts varying between 50 and 60 miles per hour, a fact neither absolutely known heretofore nor generally suspected. When this is shown by scientific investigation, the question is not entirely one of conjecture as to what the intensity may have been when the registered velocity was 24 or 36 miles an hour. These observations will set the engineering profession to thinking on the subject of providing for wind pressure in bridges and buildings. The failure of the Tay Bridge in 1879 is another example of the peculiar phenomenon of wind destruction. These results strengthen the position of meteorologists and of our government in using every means to learn more about the atmosphere and its movements. It brings to mind the prizes offered for the best essays upon the subject and the action of the national government in establishing a great weather service bureau, and the actions of states themselves in establishing bureaus within their own territory. One of the best and most promising of the state weather bureaus is probably that of New York, a notice of which will be found in another column.

The Interstate Commerce Commission has determined to prescribe a form for freight and passenger tariffs, and Chairman Morrison has issued a circular inviting the railroads to attend a conference to be held in Washington on Feb. 12. He also asks for suggestions by letter, especially concerning a form for joint tariffs. This is a good thing. There is certainly need enough of improvement in what might be called the technique of tariffs, especially freight tariffs; but the problem is a large one. Many existing tariffs are, no doubt, so nearly right in the matter of plain type, full and suitable title page, and generally intelligible make-up that the Commission would do a good thing if it were to issue a simple order that all roads conform to some one of them; but the difficulty comes in holding the roads up to the standard after it is established. The work of revising and the expense of republishing are the worst hindrances to complying with the object of the Commission, which is to have tariffs always intelligible to the wayfaring man, though he be one who only ships freight once a year. This obstacle is so serious that revision is universally shirked, and no one, not even an expert, can find a rate without studying numerous supplements. But the practice of issuing brief circulars, telling how to learn the actual rates by making certain modifications of the published figures, is not entirely without excuse, for the revision of a tariff is a great undertaking; and the conference may be expected to give us some light on how far the usual excuses should be accepted. Unfortunately the improvement of the technical details of tariffs is not likely to make rate cutters adhere to them any better; and even the best tariff is generally blind enough to bewilder the casual shipper—the one whose interests chiefly demand this action by the Commission—so that in one sense the present project will be of little account. But there is room for great improvement.

The magnificent railroad historical collection which was exhibited at the World's Fair by the Baltimore & Ohio Railroad Company has been given to the Columbian Museum, Chicago, and its removal to the Art Building in Jackson Park has already begun. Major Pangborn says, however, that it is to have a building by itself. It appears that one of the conditions on which the railroad company made this gift to the museum was that $25,000 should be raised to enable Major Pangborn, with competent assistants, to spend two years in Europe and other parts of the world to gather additional material, with a view of making the exhibit as nearly complete as possible. This fund has been guaranteed and, in fact, as appears from an interview with Major Pangborn, is given entire by Mr. Marshall Field, the chief patron of the museum. It is estimated that the outlay which has already been made for this railroad collection is $125,000. In addition to this it will be remembered that the Pennsylvania has already given to the museum the valuable collection of photographs, documents, etc., which were shown in its building at the World's Fair, and the New York Central has also given the locomotive "De Witt Clinton" and the train which was exhibited with it. Major Pangborn expects to take with him to Europe Lieut. A. C. Baker, U. S. N., who has been Assistant to the Chief of the Transportation Department of the World's Fair.

NEW PUBLICATIONS.

State Road Laws: Bulletin No. 1, on Road Inquiry. Published by the Secretary of Agriculture, Washington.

Mr. Roy Stone, Special Agent and Civil Engineer, in charge of road inquiry for the United States Department of Agriculture, has compiled the state laws relating to the management of roads which have been enacted since 1888; that is, since the agitation for good roads began, which compilation is issued as Bulletin No. 1. The laws of 14 states are given by abstracts and also in full, besides recommendations of conventions and commissions in several states which have not yet enacted laws. These recommendations for proposed laws for Illinois, Maryland and Pennsylvania discuss the various new features at considerable length, and these discussions form the most valuable portion of the bulletin. The abstracts of the laws have the appearance of being very complete, being supplemented by marginal titles of subjects referred to in the paragraphs; but this appearance is quite misleading, for many important particulars contained in the laws are omitted from the abstract. Busy men are likely to rely upon them in order to save time; they ought to be, therefore, complete in any compilation or be omitted altogether. It is of good omen that several of the new laws already enacted, and all of those proposed, recognize the importance of employing engineers and skilled labor in road building, and that road taxes must be paid in cash. Most of these new laws also contemplate a tripartite co-operation between state, county and township organizations in the building of roads of importance. In his letter of instructions to Mr. Stone the Secretary directs him to also collect data relating to the different methods of roadmaking, which shall form the foundation for a second bulletin; and he warns his subordinate that "this department is to form no part of any plan, scheme or organization, or to be a party to it in any way, which has for its object the concerted effort to secure and furnish labor to unemployed persons or convicts." We are led to wonder whether this notification is intended for the people of the United States or for Mr. Stone in particular; however, so far as we are concerned, we say, so be it!

TECHNICAL.

Manufacturing and Business.

The shops of the National Switch & Signal Company, of South Easton, Pa., were started up last week with a small force, at reduced wages. The plant has not been running since December.

The Industrial Works, of Bay City, Mich., have shipped the New York, Susquehanna & Western a wrecking crane of 15 tons capacity. They have also sold the Carnegie Steel Co. and the American Tube & Iron Co. several of their improved locomotive cranes.

At the annual meeting of the stockholders of the Addyston Pipe & Steel Co. the following directors were elected: Matthew Addy, W. P. Anderson, B. S. Cunningham, Larz Anderson, Henry Hanna, William A. Proctor, Charles D. Kinney, Alex. McDonald and B. F. Haughton.

The Fordyce Nut Lock Co., of Little Rock, Ark., has been incorporated in Arkansas. The incorporators are P. J. Conley, Edward E. Poole, Algernon S. Holderness, John D. Dunn and William Alexander. J. C. Conley is President of the company. The capital stock is $100,000, of which $10,000 has been paid in.

Mr. W. G. Norris, of Chicago, will soon sail for Yokohama, Japan, where he will open a railroad supply office. It is his intention to handle construction and supply materials as representative of various American manufacturing companies. He will represent, among others, the Wickes Refrigerator & Car Co.

The Hicks Stock Car Company has filed its answer to the suit brought by Henry O'Hara, of St. Louis, in the Circuit Court at Chicago for a receiver for the company. The company makes a general denial of all the charges in the suit. It acknowledges an indebtedness of $90,000 for money borrowed to increase its car equipment, but the claim that the company owes the complainant over $78,000 is disputed, the company asserting that it is a creditor of O'Hara for over $60,000. The charge that stock has been illegally issued is also denied.

Henry C. Ayer, of Philadelphia, is now associated with the Henry C. Ayer & Gleason Co., of Philadelphia, as General Manager. He has severed all connection with the newly incorporated Pedrick & Ayer Company as well as with the firm of H. B. Underwood & Co., operating the L. B. Flanders Machine Works. Mr. Ayer has had an experience of nearly 17 years in the manufacture of machine tools, being especially identified with the introduction of special tools for railroad repair shops. The new firm of Henry C. Ayer & Gleason Company will do a general machine business and will make a specialty of special tools for railroad repair shops and portable cylinder boring machines. The central office is at 919 Betz Building, Philadelphia, with an office and works at Second and Diamond streets.

Iron and Steel.

The Bessemer steel plant of the Ashland Steel Co., Ashland, Ky., which has been idle for some months, has again resumed operations.

The Pennsylvania Steel Company started up its works at Steelton, Pa., last week, and is now operating all but two of its departments and employing nearly 1,500 men.

A meeting of the Bethlehem Iron Co., of South Bethlehem, Pa., has been called for Feb. 14 to vote on an increase of the capital stock of the company from $5,000,000 to $10,000,000.

Equipment for the Philadelphia Electric Lines.

The General Electric Co. has secured a large proportion of the street railroad car equipment contracts awarded during the last 10 days in Philadelphia. Of 250 contracted for by the People's Traction Co., 125 equipments with the General Electric 800 motors and type K controliers were purchased from the General Electric Company, while the remaining 125 were allotted to the Sperry Company, of Cleveland. Of 80 equipments required by the Electric Traction Co. of Philadelphia. 70 will be furnished by the General Electric Company. The People's Traction Co. had already contracted for three of the great 1,5000-kilowatt General Electric generators.

Proposed Movable Elevated Sidewalk in Chicago.

The committee appointed by the Central Construction Company of Chicago to examine into the possibility of an elevated loop for the business district, and consisting of Owan F. Aldis, W. E. Hall, and C. N. Fay, made, on Jan. 19, a report favoring the elevated sidewalk as outlined in the the *Railroad Gazette* of Dec. 15, 1893. The report calls attention to the present condition of affairs and to the independent loops proposed by the various elevated railroad companies.

The committee while deprecating the construction of any unsightly elevated system on the downtown streets, assumed that sooner or later one or more of the proposed independent loops will be built and advocates instead of a number of such a system of loops which will be available to all roads and carry passengers from any of them to within two or three blocks of any downtown point. No alleys between North and South streets being available for elevated structures, and but few of these between East and West streets, it becomes necessary to occupy the streets in any proposed loop system. The committee, therefore, recommends electricity as a motive power, believing it to be less objectionable than either steam or air and advocates for rolling stock a continuous system of moving platforms, similar to the moving sidewalks at the World's Fair. The drawings accompanying the report show a single-track, structure on each side of a street, each track supported by a single line of columns set just inside the curb line and projecting over the roadway a distance of 6 ft. The total width of the two moving platforms is 8 ft. 8 in. It is proposed to have stationary platforms or sidewalks only at loading points. The system recommended is the equivalent of eight miles of single track road and consists of one long loop north on Wabash avenue, west on South Water street, south on Fifth avenue and east on Polk street to Wabash avenue. Inside of this loop are two or three shorter loops running in the opposite direction on the same street and connected with the other loop at various points by suitable bridges.

A Correspondence School of Mechanics.

Numerous inquiries have come to hand seeking information of a technical school by correspondence, and we take pleasure in bringing to the notice of our readers the announcement of The Corresponding School of Mechanics of Scranton, Pa. The school has been in existence now for several years, and from what can be learned from the catalogue is in a flourishing condition. The faculty consists of four mechanical engineers, one civil engineer, one professor of industrial chemistry and a general manager and treasurer. The number of students announced is 1,213, of which number Pennsylvania furnishes 202, New York 149, Canada 96, Ohio, Massachusetts and Illinois each 69 to 75, and other states in proportion to their distance from the school. England, Italy, Cuba, Oklahoma and the Indian Territory each furnish 1 student. Instruction by correspondence is not a new venture, such a school having been established at Cornell University in 1884; but the system does not seem to have worked so successfully in

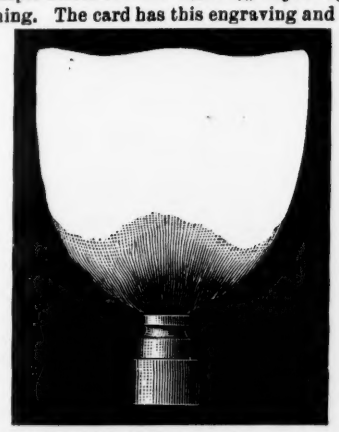
connection with the regular university training and has been, we believe, abandoned. The school is designed to afford competent instruction to mechanics whose time and means will not permit them to take a regular technical school training, and is especially designed for machinists, enginemen, firemen and apprentices who can pursue the course without having to give up their work or leave their homes. The catalogue offers some sound advice to mechanics, and explains in a lucid manner the advantages of technical training to such men. It gives a general summary of the cost of the course and of the books, stationery and instruments necessary to complete it. The catalogue contains a carefully outlined course which members of the school are expected and required to pursue and complete, after which a diploma or certificate of ability is awarded. The catalogue also contains specimens of student work done in the school, sample pages of instruction papers in different subjects and a page of examinations. Such a school deserves every encouragement in the good work which it is doing for men and boys of limited means, and if the work is carried out in the manner in which it is announced, good results must certainly follow. Catalogues will be sent upon application to the school.

Power of Niagara Falls Harnessed.

The first practical test of the great hydraulic plant at Niagara Falls was made on Friday of last week. The water was conducted through the big canal to the wheel-pit of the Niagara Falls Paper Company's mill, through the channel to the wheel-house, to the penstock of the pit, 155 ft. deep; thence to three of the largest turbine wheels ever built, and through the outlet tunnel under the city to the river below the falls, nearly two miles distant. The paper mill's contract calls for 6,600 H. P., one half of which is being used now, and the cost, including the lease of the land occupied by the mill, is reported as $8 a horse-power a year for 24 hours a day, the cheapest price, it is said, ever obtained. There now remains only the formal opening of the general power house, where 5,000 H. P. turbines will operate 5,000 H. P. electric generators for the transmission of power in this form. This opening will take place about June 1, when it is intended to have a celebration.

The Proper Size of Flame.

All trainmen on railroads where the Pintsch gaslight is used are being furnished with a pocket card giving brief, simple directions for lighting, adjusting and extinguishing. The card has this engraving and legend:



"Proper size of flame after being turned up. Where there are check screws, they should be adjusted so as to give this sized flame."

New York State Weather Bureau.

This organization has recently come into prominent notice by some experiments in wind pressures which are mentioned in an editorial note in this issue. The Bureau has resulted from the growth of a private enterprise established under adverse circumstances, in 1874, at Cornell University, by the dean of the engineering department. The recent annual report by the director shows the important relations which the Bureau's work bears to the agricultural, commercial, and technical interests of the state. There are now 76 regular volunteer stations furnishing for each day the temperatures, highest, lowest and mean; the rainfall, including the rate of fall in detail during individual showers; the direction, velocity and force of the winds; furnishing data of great value in questions of land drainage and various items relating to climate, floods, droughts, etc. During the winter special reports are made giving the amount of snow and its effects upon crops liable to injury. A weekly crop bulletin is issued in the spring, giving the statements of observers distributed over the state. Last year over 100 newspapers regularly published the bulletins.

The examination and discussion of all existing records of temperature, rainfall and other climatic elements has made satisfactory progress in the last few years. The bulk of matter which has been gathered by the Smithsonian Institution and New York Regents is very great, and the work of classifying and discussing the observations has been considerable. An examination of the reports and maps will show a remarkable diversity of climatic conditions within the state, especially in reference to the temperature, rainfall and sunshine; a fact which emphasizes the need of a thorough research into the climate of New York. The results thus far obtained indicate that the large number of observations accumulated by the State Bureau must be relied on to determine the ruling characteristics of our climate. The Bureau contemplates an early publication upon the climate of New York. It has secured the co-operation of about 300 persons whose public spirit prompts them to carry on the various branches of the work without compensation.

The National Weather Service saves to the state service considerable expense by providing display flags, stationery, and franking 40,000 pieces of mail matter annually by defraying the cost of telegraphing, and also by the detail of an assistant to the Central Office. It is estimated that if the state were to pay a fair compensation for salaries and expenses above enumerated, the service would cost over $32,000 a year aside from printing the publications, while the state appropriation is only $4,500.

THE SCRAP HEAP.

Notes.

It is reported that the Cincinnati, Hamilton & Dayton, the Baltimore & Ohio Southwestern and the "Big Four" on Feb. 1 reduced the salaries of a number of general officers, as well as clerks and shop and train men.

Judge Dundy, in the United States Court at Lincoln, Neb., has made an order approving a new schedule of wages filed by the Union Pacific Receivers, and restraining the employees from combining or conspiring to interfere with the business of the railroad.

The Firemen's and other railroad brotherhoods, or their leaders, are trying to get Congress to consider articles of impeachment against Judge Jenkins, of the Federal Circuit Court in Wisconsin, on account of his action in granting an injunction to restrain the employees of the Northern Pacific from joining in a strike and the officials of the labor organizations from inciting a strike.

A law to require the use of the block system on all railroads has been presented in the New Jersey Legislature. In Massachusetts a bill has been offered to require the railroads to sell mileage tickets at two cents a mile. In Ohio, Mr. Heinlein has introduced a bill authorizing the Railroad Commissioner to require automatic alarm bells at highway crossings, and another bill proposes to make railroad companies liable for all loss by fire originating on lands belonging to the railroad company and caused by the operating of the road, and making the existence of the fire *prima facie* evidence that the same was caused by the railroad.

The United States Supreme Court, in an opinion by Justice Jackson, handed down this week, has affirmed the constitutionality of the Georgia "county tax law," which was passed by the legislature of that state in 1889. It provided for the taxing of rolling stock and personal property of a railroad company in each county in which the railroad was located, the amount of the tax being prorated according to the total length of the road in the state. The Richmond & Danville and the Central of Georgia paid the tax, but nearly all the other roads in the state resisted payment, and sued for an injunction against the collection of the taxes, which was refused by the Georgia Supreme Court, and Justice Jackson affirms this judgment.

The United States Court of Appeals sitting at St. Louis has decided in favor of the Union Pacific Railroad and the Western Union Telegraph Co., in the suit begun by the Government to compel the railroad to operate its own telegraph lines, and to have the lease made in 1881, to a company now controlled by the Western Union, declared illegal. The Circuit Court had decided against the railroad, and issued a decree annulling all contracts between the Union Pacific road and the telegraph company, and ordering the railroad company to operate its telegraph lines in accordance with the law. In reviewing that decision the Court of Appeals orders a reversal, holding that Congress would not grant to the railroad a telegraph franchise and so limit the power to exercise or deal with it as to make it a burden.

Spanish American Notes.

The municipality of Iquique, Chili, has petitioned Congress for authority to raise a loan of $2,000,000 for the construction of water works.

The Buenos Ayres Western Railroad reports gross receipts for the half year ended Dec. 31, 1893, of $1,333,676, with operating expenses $577,615 (43.31 per cent.), leaving net earnings of $756,061.

Arrangements have been perfected for the establishment of a street railroad in Tegucigalpa, the capital of Honduras, and Señor Carlos D. Beyer has been sent to this country to purchase the necessary equipment.

The Colombian government has paid the sum of $122,780, amount of accrued interest to June 30, 1893, on account of guarantee on the capital invested in the Cauca Railroad. This is evidence not only that the government is keeping faith with the American company which is building this line, but that the company is fulfilling its part of the contract satisfactorily.

The gross earnings of the Central Argentine Railroad, which has a government guarantee, for the year 1893 amounted to $2,999,535. The operating expenses for the first half of the year were 55.56 per cent., and for the second half about 65 per cent. Taking an average for the year of 60 per cent., this makes $1,799,721, showing net earnings of $1,199,814 upon a length of line of 746 miles.

The receipts from the Buenos Ayres Great Southern Railroad (Argentine) for the half year ended Dec. 31, 1893, amounted to $2,407,508. The operating expenses were 42 per cent., or $1,011,153, leaving net receipts of $1,396,355, to which must be added income from other sources of $48,600, making a total of $1,444,955. After deducting fixed charges there will result a net income of $420,769.

The bill for the sale of the nitrate deposits belonging to the government of Chili has been passed by Congress. The executive is authorized to sell the properties after advertising in papers in New York, London, Paris and Berlin as well as in Chili. The terms of sale will be 20 per cent. at the time of purchase, 30 per cent. at the end of the first year, and the remainder at the end of the second year. Bidders will be required to give security for 40 per cent. of the amount they may bid.

Illinois Central Suburban Express Trains.

Beginning with Jan. 25, the Illinois Central began running its suburban express trains to Grand Crossing instead of to Sixty-third street as it has been doing since the close of the World's Fair. Trains are run between Van Buren street and Grand Crossing every fifteen minutes during the day. The last train in the evening leaves Grand Crossing at 7:30 p. m. Stops are made at Fifty-third, Fifty-seventh, Sixtieth, Sixty-third and Sixty-seventh streets, the fare being 10 cents to all places. The run from Van Buren street to Grand Crossing is made in 23 minutes, which is 14 minutes faster than the regular suburban trains. These express trains as far as Sixty-third street have been running since Nov. 1, and have been well patronized.

Toledo, St. Louis & Kansas City Employees' Wages.

Judge Ricks, in the United States Court at Toledo, has refused the request of the employees of the Toledo, St. Louis & Kansas City that the Court set aside the wage schedule enforced by Receiver Callaway. The Court was satisfied that the reduction in wages was necessary, just, and inevitable in view of the condition of the road. Judge Ricks' opinion is long, and after reciting that the petition was filed by over 500 employees, who chose to go into court rather than strike or embarrass the Receiver in the management of the property, and, commending this action, says: I have therefore undertaken to state their claims at length and with fairness, to show them how impossible it is for a Court to enter into a detailed investigation, such as their petition invites, with any possibility of reaching an intelligent and just conclusion. The present financial condition of the property and the business depression all combine to satisfy the Court that the claims of the Receiver, that this reduction in wages was absolutely necessary and inevitable, are manifestly true and just. During the time this property has been in the custody of the court I have studied closely the policy and management of the Receiver. He has the confidence of the Court in the highest degree. He was chosen because of his long experience and conceded ability. . . . If it were a mere matter of personal preference or an appeal to the generous impulses of the Court or the Receiver, there would be no reduction of wages. . . .

New York Rapid Transit Plans.

The most important development in rapid transit matters at New York during the week has been the definite announcement that a plan would soon be formulated for building an underground rapid transit road with private capital. John H. Davis & Co., bankers of 10 Wall street, New York, represent the prospective investors, and they state that they will submit to the Rapid Transit Commissioners in a few days a statement of the conditions under which they are willing to undertake the building of the proposed underground road. The Commissioners still hold the plan proposed by R. T Wilson & Co., which asks for a guarantee by the city to the amount of $30,000,000 under consideration, but have taken no action.

Purdue University Laboratories Burnt Up.

Railroad men will be grieved to learn of the total destruction of the fine mechanical laboratory of Purdue University. It was destroyed by fire on Jan. 23, in the evening, together with the fine railroad equipment which it contained and which has been of so great value to the Master Mechanics' and other associations in conducting tests of railroad appliances. The main part of the laboratory was a two-story structure with a large central tower 125 ft. high. This, together with two one-story wings, all of brick and stone, covered more than an acre of ground. The equipment was new and of the best, including a locomotive on movable tracks, a number of Westinghouse and Corliss compound and cut-off engines, and a collection of scientific apparatus constituting one of the most notable mechanical laboratories in the United States. The building cost $100,000; and had only just been accepted from the contractors. The equipment was put in at an outlay of $70,000, not including many valuable gifts. The total insurance will not exceed $45,000. It is reported that immediate steps will be taken to rebuild, and in the meantime the mechanical department will be conducted in other quarters.

A Heavy Piece of Freight.

The New York, New Haven & Hartford, the New York & New England and the West Shore have lately carried from Stony Creek, Conn., to West Point, N. Y., a granite monument weighing 92 tons. The shaft is round, 41½ ft. long and 6½ ft. diameter at the larger end. It was carried on two platform cars, of the style used in carrying locomotives, the side sills being strengthened with additional timbers. The monument rested on a frame so built as to distribute the load evenly on each car. The cars were rated at only 50,000 lbs. capacity each, but they were run at low speeds. It appears that some of the bridges between Hartford and Fishkill were not deemed strong enough to support the combined load of the locomotive and cars with the proper margin of safety, and the latter were therefore run across at some distance from the engine, after the manner of a flying switch. From West Point station, on the West Shore, to the top of the hill at the Military Academy, about 4,000 ft. away, and 150 ft. above the tracks, the cars were taken up by means of a section of movable track, about 200 ft. long, laid in the highway. A portable engine with upright boiler was fixed upon one end of one of the cars, and the load was hauled up by block and tackle fastened to a post about 100 ft. in advance.

The Fairview Accident.

Reliable information has come to hand of the disaster on that part of the New York, Susquehanna & Western Railroad in process of construction across the Jersey Meadows. The accident was caused by the giving way of a piece of a temporary trestle built by the contractors for their own use in making an embankment across the meadows of gravel hauled from Paterson (not of rock from the tunnel). Eight hundred feet of double track embankment, 26 ft. high, had been made between the West Shore railroad and Bellman's Creek. The weight of this embankment had caused irregular and intermittent but general subsidence of the meadow, or rather a displacement of the marsh mud which overlies the clay. This settling had kept the temporary trestle in an unsettled condition which required daily attention on the part of the contractors. The trestle would be carried out of line first one way and then another, or would go down with the general settlement of the material, and required frequent jacking and blocking up as is usual in such cases. The material of the embankment was hauled in gondola cars of 20 cu. yds. capacity, and six to eight of them at a time were pushed on to the trestle and unloaded by a large force of shovelers. The embankment west of Bellman's Creek had been completed and the contractors had just begun upon the embankment east of the creek when the accident occurred. The probable cause of the failure was

the sudden sinking of a pile on the north side of a bent about 200 ft. east of the creek, inclining it to the north so far that the weight of the loaded train tipped it over, together with the unfortunate men who were about to unload the cars. Four were fatally injured and about 20 less severely. The piles at this point were driven in an artificial excavation locally known as the "V," to the depth of about 7 ft. below the general surface of the meadows.

Chicago Street Railroad Earnings.

At the annual meeting of the stockholders of the West Chicago Street Railway Co. the report of the Treasurer showed a net increase in the earnings over the previous year of $409,736. The number of passengers carried was 107,053,461, an increase of 12,534,987. The report showed—

Gross earnings for the year	$5,235,633
Operating expenses	2,892,982
Net earnings	$2,342,651
Payment of fixed charges, interest, etc	941,747
Balance applicable to dividends	$1,400,901
Dividends paid at 9 per cent	991,552
Carried to surplus	$409,349

This raises the surplus of the company to $1,862,841, and the floating debt is now all out of the way. The old board of directors was re elected unanimously.

A meeting of the stockholders of the North Chicago Street Railway was also held on the same day, and the annual report showed the largest earning ever made. The report of the Treasurer was:

Receipts for the year	$3,101,148
Expenses	1,412,755
Net earnings	$1,688,392
Payment of fixed charges, interest, etc	533,874
Balance applicable to dividends	$1,154,518
Dividends paid at 11½ per cent	618.574
Carried to surplus	$535,943

The surplus is now $1,264,344, and the earnings were 21 per cent. on the capital stock. The old board of directors was re-elected, with one exception.

LOCOMOTIVE BUILDING.

The Canadian Locomotive & Engine Co., of Kingston, Ont., has been given the contract for the construction of two large engines, each with 10 driving wheels, for the Intercolonial Railroad.

The Richmond & Danville order for eight passenger locomotives has been let to the Baldwin Locomotive Works and the Richmond Locomotive Works. The Baldwin Works will build five of the engines and the Richmond Works the other three. The delivery is to be made in March.

CAR BUILDING.

The Metropolitan Elevated of Chicago is reported in the market for 100 passenger cars.

The Barney & Smith Car Company, of Dayton, O., is building 100 special dump cars for the Baltimore & Ohio Southwestern.

The Ohio Falls Mfg. Co., of Jeffersonville, Ind., is building a small number of passenger cars for the Chicago & Grand Trunk road.

The Lamokin Car Works, at Chester, Pa., have received a contract for 40 electric cars for the Philadelphia Traction Company, and this order with other contracts will keep the shops in operation most of the summer.

The car shops of Arthur King, at Middletown, Pa., which have not been in operation for a number of months, started up last week on an order for 40 cars. The revival of car building has not yet become so pronounced that even such an order as this can be overlooked.

BRIDGE BUILDING.

Allentown, Pa.—Ths court will be petitioned shortly to pass favorably upon the building of a bridge over the valley between South Allentown and Salisbury.

Boston.—The City Engineer, at the request of the Board of Alderman, has prepared an estimate for a proposed bridge connecting the city of Boston with Chelsea, Mass. The cost is given as $29,000 and the state legislature will be asked to authorize the construction of the bridge by the city's name.

Butler County, O.—A bill is pending in the Ohio Legislature to authorize the County Commissioners of Butler County to issue $55,000 in bonds to build a bridge over the Miami River at Hamilton, O.

Cincinnati, O.—A bill introduced in the Ohio Legislature authorizes the Cincinnati Board of Control to construct a bridge over Kenton street, at a cost not to exceed $50,000.

Elizabeth, W. Va.—The county court of Wirt County, W. Va, with headquarters at Elizabeth, will let the contract on Feb. 12 for a highway bridge over Right Reedy Creek.

Etobicoke, Ont.—The Municipal Council has applied to the legislature for power to raise $8,000 for the purpose of constructing bridges across the Mimico Creek, on the Lake Shore road, and Queen streets.

Florence, Col.—The County Commissioners have finally authorized the building of a new county bridge over the Arkansas River at this point. The structure will be of iron, about 250 ft. long, and will cost about $10,000.

Franklin County, O.—County Engineer Dun has recommended that a new bridge be erected over Alum Creek, to take the place of the present iron structure at Main street, Columbus, which cost about $40,000. No action has been taken by the County Commissioners. On Jan. 31, bids will be opened by the County Commissioners for the new Lockbourne bridge.

Gahanna, O.—A bill has been introduced in the Ohio Legislature to repeal the law authorizing the expenditure of $15,000 by the Franklin County Commissioners to build a bridge over Big Walnut Creek at Gahanna.

Hamilton County, O.—A bill before the Ohio Legislature authorizes the County Commissioners of Hamilton County to construct a $3,000 bridge over Dry Fork Creek.

Harper's Ferry, Va.—The Baltimore & Ohio tunnel is completed, and in less than a month cars will be running over the new steel bridge, the last spans of which are now being put in position.

Millvale Borough, Pa.—Proposals will be received by S. Eades Burgess until Feb. 6 for the construction of an iron structural bridge on Sheridan street in this borough.

Newcomerstown, O.—The Ohio Legislature has authorized the County Commissioners of Tuscarawas County to spend $10,000 in completing and repairing the bridge over Tuscarawas River at Newcomerstown.

New York City.—A bill appropriating $2,500,000 for a new bridge across the Harlem River is now before the New York Legislature. A similar bill was defeated in the last legislature on account of the opposition of the New York City authorities, but it is stated that their objections have been overcome. The bridge is to connect First avenue at 125th street with Willis avenue at 135th street and will cross the tracks of the New York, New Haven & Hartford road by a viaduct. The city is authorized to issue bonds to construct the bridge, but it is not required to be built for six years.

Oateville, Ont.—The town will be granted the sum of $3,000 from the county of Halton toward building an $8,000 swing bridge.

Ottawa, Ont.—The City Council has decided to construct a steel instead of a wooden bridge connecting Potter's Island with the mainland. The tender of the Dominion Bridge Co. for the work has been accepted.

W. Dale Harris, Chief Engineer, has commenced the preliminary survey in connection with the Interprovincial Bridge from Hull, Quebec, to Nepeau Point, Ont. After fixing upon a site and making soundings, a complete report will be submitted to the various governments, from whom a subsidy will be asked.

Philadelphia.—A resolution has been introduced in the Common Council to instruct the Department of Public Works, Bureau of Surveys, to prepare plans and specifications for a bridge across the Schuylkill River to connect Passyunk avenue on the east side, with Sixty-third street on the west side of the river.

Pittsburgh, Pa.—The Wrought Iron Bridge Co., of Canton, O., has been awarded the contract to build the three-span steel bridge, 1,086 ft. long, for the Pittsburgh, Corapolis & Neville Island Electric Railway Co. Work will be commenced about March 1. The structure will be wide enough for two tracks and sidewalks. Edeburn & Cooper are the engineers. The bridge will cross the Pittsburgh & Lake Erie and Junction roads at a height of 221 ft.

Simcoe, Ont.—The County Council has voted a considerable sum for the construction of county bridges.

Ste. Croix, N. B.—Civil Engineers Holt and Wetmore are preparing plans for a new bridge to be constructed here.

Strathroy, Ont.—The Board of Roads Directors have recommended calling for tenders for new bridges, one between Caradoc and Metcalfe and one over Dignan's Creek, between Delaware and Westminster.

Warren, Pa.—Plans are now being prepared for four new steel bridges on the Dunkirk, Allegheny Valley & Pittsburgh, and contracts will be let soon.

Winnipeg, Man.—The City Council has recommended the issue of debentures for the erection of a bridge over the Assiniboine River at Main and Osborne streets, to cost $80,000; over the Canadian Pacific yard west of Princess street, $30,000; over the Red River north of Louis Bridge, $80.000, and a bonus to St. Boniface on the completion of an iron bridge with stone piers, by that municipality, at the foot of Market street, $10,000.

MEETINGS AND ANNOUNCEMENTS.

Dividends:

Dividends on the capital stocks of railroad companies have been declared as follows:

Canadian Pacific, semi-annual, 2½ per cent. on the common stock, payable Feb. 17.

Evansville & Terre Haute.—The announcement in our last issue that this company had declared a semi-annual dividend of 3 per cent., payable Feb. 1, is erroneous.

Pullman's Palace Car Co., quarterly, 2 per cent., payable Feb. 15.

Rome, Watertown & Ogdensburg, quarterly, 1¼ per cent., payable Feb. 15.

Terre Haute & Indianapolis, semi-annual, 3 per cent.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Baie des Chaleurs, special, Montreal, Feb. 19.
Chester & Lenoir, special, Gastonia, N. C., Feb. 14.
Cumberland Railway & Coal Co., annual, Montreal, Canada, Feb. 14.
Delaware, Lackawanna & Western, annual, New York City, Feb. 20.
Eastern Kentucky, annual, Riverton, Ky., Feb. 7.
Grand River Valley, Jackson, Mich., April 25.
Great Eastern, annual, Montreal, Feb. 6.
Guelph Junction, annual, Guelph, Canada, Feb. 6.
Huntingdon & Broad Top Mountain, annual, Philadelphia, Pa., Feb. 6.
Junction Canal & Railroad Co., annual, Elmira, N. Y., Feb. 6.
Keokuk & Western, annual, Keokuk, Ia., Feb. 7.
Missouri Pacific, annual, St. Louis, Mo., March 13.
Monterey & Mexican Gulf, special, New York City, Feb. 20.
New York, Lake Erie & Western, special, New York City, March 6.
Nicola Valley, special, Vancouver, B. C., Feb. 20.
Peoria & Eastern, annual, Danville, Ill., Feb. 14.
St. Louis, Iron Mountain & Southern, annual, St. Louis, Mo., March 13.
Southwestern, annual, Macon, Ga., Feb. 8.
Summit Branch, annual, Philadelphia, Pa., Feb. 13.
Western Terminal Co., special, Pittsburgh, Pa., Mar. 20.
Wood Mountain & Qu' Apelle, annual, Winnipeg, Feb. 7.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Master Car Builders' Association* will hold its annual convention at Saratoga, N. Y., June 12. The hotel headquarters will be at Congress Hall, H. S. Clements, Manager.

The *Master Mechanics' Association* will hold its annual convention at Saratoga, N. Y., in June, immediately following the M. C. B. convention.

The *Freight Claim Association* will hold its annual meeting in Louisville, Ky., March 14.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each month.

The *Western Railway Club* meets in the rooms of the Central Traffic Association, Monadnock Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *Northwest Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, except June, July and August, at 8 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Tacoma Society of Civil Engineers and Architects* meets in its rooms, 201 Washington Building, Tacoma, Wash., on the third Friday in each month.

The *Association of Engineers of Virginia* holds informal meetings the third Wednesday of each month, from September to May, inclusive, at 719 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, Bromfield street, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Western Society of Engineers* meets at 78 La Salle street, Chicago, on the first Wednesday in each month, at 8 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas Place, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' Society of Western Pennsylvania* meets at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 8 p. m.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesdays of each month except during July, August and December, when they are held on second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

Illinois Society of Engineers and Surveyors.

The ninth annual meeting of the Illinois Society of Engineers and Surveyors was held at the University of Illinois, Champaign, Ill., Jan. 24, 25 and 26. S. S. Greeley, of Chicago, in the president's address, gave a view of the possible accomplishments of the engineering profession in 1944. Among the papers of especial interest to railroad men were: Experience with Creeping Rails, W. D. Pence; Bridge Erection, W. F. Kendall; Notes on Foundations of Granite Viaduct, E. I. Cantine; and Cribs and Retaining Walls, E. M. Benson. A paper by E. A. Hill on Cost of Work brought out the value of such data to the engineer, and a committee was appointed to collect and collate data on the cost of engineering work. Among other papers presented were: Mechanical Aids in Computing, Prof. I. O. Baker; Mechanical Computing Apparatus, Prof. N. C. Ricker; Indexing and Filing Engineering Literature, Prof. L. P. Breckenridge; The Transportation Problem of the Future, F. S. Balcom; and South America and Young Engineers, P. Mogensen. Alve & Co., St. Louis; Dietzgen & Co., Chicago; Keuffel & Esser, New York; and Seelig & Candler, Chicago, exhibited engineering instruments. The various departmenes of the University of Illinois were visited, especial attention being given to the shops and laboratories and to the new engineering building now under construction. The following officers were elected for 1894: *President*, D. W. Mead, Rockford; *Vice-President*, T. S. McClanahan, Monmouth; *Executive Secretary and Treasurer*, J. A. Harmon, Peoria; *Recording Secretary*, W. D. Pence, Champaign. The next meeting will be held in Monmouth in January, in 1895.

Engineers' Club of Philadelphia.

A business meeting of the club will be held on Saturday, Feb. 3, at 8 o'clock p. m. A paper entitled "The Magnetic Concentration of Iron Ores" will be read by Edward K. Landis.

The annual meeting was held on Jan. 20, President John Birkinbine in the chair, 67 members present. The tellers reported that Messrs. Hugo S. Hund, E. A. W. Jefferies, Andrew Callahan, Jr., and Thomas J. Carlile had been elected to active membership, and Messrs. George F. Payne and DeLouie Tice to associate membership.

The report of the Board of Directors for the year 1893 stated that during the year there had been 18 regular meetings of the club, at which there was an average attendance of 46; the maximum attendance being 68, and the minimum 32.

The Publication Committee during the year issued four numbers of the *Proceedings*. The question of allowing papers to be printed in advance of their appearing in the *Proceedings* has been discussed, but no definite rule has been adopted by the Committee. The Committee has now on hand the preparation of an index to the *Proceedings*, extending over ten years. The additions to the membership have been 42 active and seven associate, making a total of 49. Thirteen active members were dropped from the rolls Jan. 1, 1893, under the by-laws. The number of resignations during the year was 36 from active membership and 2 from associate membership.

The following table gives the number of members in the club on the 31st of December, 1893:

	Resident.	Non-Resident.	Total.
Honorary	0	1	1
Active	271	163	434
Associate	13	4	17
Total	284	168	452

A comparison with the record of last year will show that the number of resident members has increased by 8, and that of the non-resident has decreased by 13.

The Treasurer reported total receipts during the year of $6,858, and expenditures of $6,793, leaving a balance of $65.

Mr. John Birkinbine then delivered the annual address, in which he referred to the large manufacturing and industrial interests of Philadelphia, in which engineers are interested. He also gave some interesting statistics as to the amount of railroads, sewers, water and gas pipe, telephone and telegraph wires, etc., in the city limits. The tellers reported that 128 legal votes had been cast, and the following candidates were declared elected:

President, John C. Trautwine, Jr.; *Vice-President*, A. Falkenau; *Secretary*, L. F. Rondinella; *Treasurer*, George T. Gwilliam; *Directors*, Edward K. Landis, Silas G. Comfort, Charles L. Prince.

Engineers' Club of Cincinnati.

The sixth annual meeting of the club occurred on the evening of Dec. 21, 1893. There were 37 members and a number of visitors present. The Secretary and Treasurer presented report of the condition and finances of the club for the past year. Ten meetings were held, with an average attendance of 24. Nine new members were added, which makes the present membership 115. The officers elected for the ensuing year are as follows: *President*, W. B. Ruggles; *Vice-President*, H. J. Stanley; *Directors*, Chas. A. Ewing, R. L. Engle and C. E. Lindsay; *Secretary and Treasurer*, J. F. Wilson. The retiring President, Col. Latham Anderson, addressed the club in a well prepared paper on the "Progress of Engineering During the Past Year."

Boston Society of Civil Engineers.

A regular meeting of the society was held at its roome, 36 Bromfield street, Boston, on Wednesday, Jan. 24.

A committee consisting of Henry Manley, E. S. Dorr, C. F. Allen, T. H. Barnes and F. W. Hodgdon was elected to nominate officers for the ensuing year.

The discussion of the evening was on The Organization of a City Engineer's Office and the Best Methods of Carrying on its Work, presented at the last meeting.

Mr. A. F. Noyes read abstracts from his paper presented at the last meeting on the Organization of the Office. The discussion was continued by Messrs. L. M. Hastings and W. E. McClintock. A description of the Organization of the City Engineer's Office at Providence, R. I., prepared by Mr. O. F. Clapp was read by the Secretary.

The following papers were then read: The Management of a City Engineer's Office, by Mr. G. A. Kimball, which was discussed by Messrs. McClintock and Stearns; The Relations of the City Engineer to the Landscape Architect and to Public Parks, by John C. Olmsted; City Surveys and Maps, by W. E. McClintock. Mr. Fred. Brooks spoke of rectangular co-ordinates and uniformity of datum plane of levels in the relation to municipal surveys.

A special meeting of the Society will be held on Tuesday evening, Feb. 6, to continue the discussion on the work of a Civil Engineer's Office.

Engineers' Society of Western Pennsylvania.

The fourteenth annual meeting of the Society was held Jan. 16, 1894, President M. J. Becker in the chair.

The following officers were elected for the year 1894: Charles Davis, President; W. G. Wilkins, Vice-President; Julian Kennedy and T. P. Roberts, directors; A. E. Frost, Treasurer, and D. Carhart, Secretary.

After the annual meeting the regular monthly meeting of the Society was held, President Davis in the chair.

The Chemical Section elected the following officers for 1894: Chairman, Walter E. Koch; Vice-Chairman, James M. Camp; Secretary, Abram T. Eastwick. Additional directors, Prof. F. C. Phillips and James O. Handy.

PERSONAL.

—Mr. John P. Cummings, Assistant Superintendent of the steel plant of the Phœnix Iron Works, Phœnixville, Pa., has resigned.

—Mr. George N. Walker, Resident Engineer of the Jacksonville Southeastern line at Jacksonville, Ill., has resigned, and that office, as well as that of the chief engineer, has been abolished.

—Mr. W. D. B. Motter, a prominent railroad lawyer, of St. Joseph, President of the St. Joseph Railroad Terminal Company, and a director of the St. Joseph, St. Louis & Santa Fe, died at his home in St. Joseph, Mo., Jan. 21.

—Mr. O. F. Nichols, who has been General Manager and Chief Engineer of the Brooklyn Elevated Railroad for nearly two years, has resigned the first named office. He will continue to act as Chief Engineer, a position to which he was appointed in 1888.

—Mr. G. S. Fernald has been appointed special counsel of the Northern Pacific, continuing to discharge the duties of Tax Commissioner. He has been connected with the company for the past ten years. Until April, 1890, he was local counsel and at that time was appointed General Tax Commissioner.

—Mr. William S. Brand has been appointed Acting Superintendent of the Georgia Railroad, to succeed Mr. S. A. Hemphill, whose resignation as Superintendent takes effect on March 1. Mr. Brand has been Private Secretary for the General Manager of the Georgia Railroad since 1887. Previous to that he was telegraph operator at Augusta, and has served in that capacity on a number of Southern railroads.

—Mr. Isaac D. Barton, recently General Superintendent of the New York & New England, was this week appointed General Superintendent of the Brooklyn Elevated Railroad. Mr. Barton was for a number of years General Superintendent of the Long Island Railroad and went to the New England road in 1892, when Mr. Austin Corbin was elected President of that company. He retired from that position in November last.

—Mr. A. H. Lighthall has been appointed a Commissioner of the Park Avenue Improvement in New York. This work includes the elevation of the tracks of the New York Central & Hudson River Railroad below the Harlem River, the cost of which is to be borne jointly by the railroad company and the city. Mr. Lighthall is a civil engineer, and succeeds Mr. George W. Birdsall, who resigned because of his duties as Chief Engineer of the Public Works Department of New York.

—Mr. C. C. F. Bent, who recently resigned as Superintendent of Construction on the Baltimore & Ohio Southwestern, has been appointed Superntendent of the Philadelphia division of the Baltimore & Ohio Railroad, with headquarters at Philadelphia, succeeding Mr. J. Van Smith, promoted to be General Superintendent of the lines east of the Ohio River. Mr. Bent, it will be remembered, was for a number of years Superintendent of the Ohio & Mississippi road until its consolidation with the Baltimore & Ohio Southwestern.

—Mr. Gyles Merrill, General Superintendent of the Central Vermont Railroad until 1873, died at his home, Haverhill, Mass., on Jan. 23, of pneumonia. Mr. Merrill early in his business life was with various manufacturing concerns. He went to Charlestown, N. H., in 1852, to act as agent of the Sullivan Railroad, now a part of the Central Vermont system, and soon became Superintendent. Mr. Merrill's connection with the Central Vermont Railroad dates from March 3, 1859, when he was chosen Superintendent of the combined Vermont Central and Vermont & Canada railroads, continuing until impaired health caused his resignation in 1873, the company at that time operating 800 miles of road.

—Mr. Samuel Higgins has been appointed Superintendent of Motive Power of the Lehigh Valley Railroad, a position which has been vacant since the recent transfer of Mr. Alexander Mitchell to be Superintendent of the Wyoming Division of the railroad. Mr. Higgins has been Assistant Superintendent of Motive Power of the Erie lines at Cleveland, O., for nearly two years, in charge of the "Nypano" division. His entire railroad service up to the present time has been with the New York, Lake Erie & Western, beginning in 1881 as an apprentice. He has since been machinist foreman of the shops at Susquehanna, Assistant Engineer in the motive power department, becoming Division Master Mechanic in 1887, holding that office until 1892, when he was promoted to be Assistant Superintendent of Motive Power.

—The Hon. George H. Ely, of Cleveland, Ohio, who died of heart disease at Washington, D. C., on Jan. 24, was born in Rochester, N. Y., in 1825. He graduated at William's College and commenced business as a miller and forwarder on the Erie Canal. His attention was early called to the value of the iron ore deposits on Lake Superior, and with his two brothers, the late Herman B. and Samuel P. Ely, he built the first railroad, the Iron Mountain, from the lake shore to the mines, completing it in 1857. About this time he moved to Cleveland and has acquired large interests in iron ore both in Michigan and Minnesota as well as in Cuba, and at his death was President of the Western Iron Ore Association. His visit to Washington was in the interest of the iron ore miners and carriers, as Mr. Ely's connection with mining, forwarding and sale of iron ores led him to take an active interest in cheapening the cost of transportation on the Great Lakes, and for years he has been one of the most influential advocates of deep and straight channels. The Deep Waterways Convention of 1887 was due largely to his advocacy as have been the subsequent ones. The defeat in 1880 and 1890 of the plan for bridges at and near Detroit was undoubtedly largely due to the careful presentation he made to Congress of the amount and value of the water-borne traffic passing that city. He was a tireless worker, with great skill in combining the vessel interests in favor of deeper waterways and greater skill in presenting facts. He has been an important factor in the development of the wealth of the lake region. His too early death leaves his work incomplete.

Mr. Ely had been a State Senator, a Trustee and President of the Cleveland City Hospital, Trustee of the Adelbert College and Western Reserve University, besides being Director in many railroads and commercial companies. At the time of his death he was President of the Central National Bank of Cleveland. He was also an associate of the American Society of Civil Engineers, and as such he attended the Fifth International Congress on Inland Navigation at Paris in 1892, where he read a paper, "The Great Lakes of North America," which has since furnished statistics to nearly all writers on water transportation in America.

ELECTIONS AND APPOINTMENTS.

Columbus, Sandusky & Hocking.—At a meeting of the newly-elected Executive Committee of the Board of Directors, held at Columbus, O., Jan. 27, the reorganization of the operating department, resulted as follows: H. O. Pond, of Columbus (formerly Superintendent of the Columbus, Shawnee & Hocking) was elected Superintendent; M. T. Seymour (formerly of the Columbus, Hocking Valley & Toledo, but later Superintendent of the Sandusky & Columbus Short Line), Master of Transportation; J. B. Wilcox (formerly of the C., S. & H.), Chief Engineer; C. A. Covert, Auditor and Assistant Treasurer; W. W. Daniel, General Freight and Passenger Agent.

Cumberland Valley & Martinsburg.—A meeting of the stockholders of this company was held at Martinsburg, W. Va., on Jan. 25, at which the following directors were eleeted: Thomas B. Kennedy, George M. Bowers, A. J. Thomas, Holmes Conrad, J. F. Boyd, John Stewart, E. Boyd Faulkner, William T. Stewart, James B. Russell, R. W. Stone, H. H. Baker, Thomas J. Cooper and M. C. Kennedy. Thomas B. Kennedy was chosen President; James B. Russell, Treasurer; and M. T. Ingless, Secretary.

Gila Valley, Globe & Northern.—A. C. Laird, of Los Angeles; Julius Liberman, J. Solomon, of Solomonville; D. W. Wickersham, of Bowie, Ariz.; and E. A. Cutter, of Bonita, Ariz., were elected directors of the company recently. E. A. Cutter is President of the company, D. W. Wickersham Vice-President, and A. C. Laird Secretary and Treasurer.

Kings County Elevated.—The directors have elected James Jourdan, of Brooklyn, President; August Belmont, of New York, Vice-President; James H. Frothingham, Treasurer; and Henry J. Robinson, of Brooklyn, Secretary.

Louisville & Nashville.—The directors have elected John I. Waterbury, President of the Manhattan Trust Company, to fill one of the two vacancies that have existed in the board.

Northern Pacific.—G. S. Fernald, General Tax Commissioner, has also been appointed special counsel with jurisdiction over the entire Northern Pacific system.

Pittsburgh & Lake Erie.—The annual meeting was held in Pittsburgh, Pa., Jan. 23, and the following directors elected: John Newell, Cornelius Vanderbilt, William K. Vanderbilt, F. W. Vanderbilt, Hamilton McK. Twombly, E. D. Worcester, M. W. Watson, Henry Hice, A. E. W. Painter, James M. Bailey, J. H. Reed, J. M. Schoonmaker, D. Leet Wilson. The following officers were elected: President, John Newell; Vice-President, J. H. Reed; Secretary and Treasurer, J. G. Robinson.

St. Louis Southwestern.—J. J. Kress, Trainmaster of the Arkansas Division, with headquarters at Pine Bluff, has been appointed Superintendent of Car Service, with headquarters at Texarkana, Tex., succeeding Day Mills, resigned.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Baltimore & Northern.—On January 22 a party of engineers began to make the preliminary surveys for this proposed road, which is to extend from Baltimore, Md., to a point near Delta, Pa. Connection is to be made at Baltimore with the Baltimore Belt road at some point within the Baltimore city limits. Entrance is to be had to York, Pa., over the York & Peachbottom road.

Duluth & Winnipeg.—A bill has been introduced in the United States Senate granting to this road right of way across the Red Lake and White Earth Chippewa Indian reservation in Minnesota. If this bill becomes a law one of the obstacles which has prevented the extension of the road will be removed. Since the property has passed practically into the control of the Canadian Pacific it is thought that the line will be extended through the Red River Valley to the International boundary, where it will connect with one of the branches of the Canadian Pacific, either at Neche or Emerson, making a direct line from Winnipeg to the head of Lake Superior.

Elkton & Middletown.—The possibility of losing all claim to the $58,000 in county bonds which was voted to the company in 1880 has revived the interest of the projectors of the road. At Elkton, Md., last week a meeting was held between Jacob Tome, of Port Deposit; H. H. Brady, of Chesapeake City; Thomas Drenen, of Elkton, and others interested to formulate some plan to make at least a show toward active work. The road was projected to extend from Elkton south to Middletown on the Pennsylvania, but recently the Elkton & Southern has been organized to build south of Elkton, and hopes to secure a transfer of the subsidy voted to the above company.

Gila Valley, Globe & Northern.—This project has been recently revived, and new directors elected, E. A. Cutter, of Bonita, Ariz., being the President, and A. C. Laird, of Los Angeles, Cal., Secretary and Treasurer. William Garland, of Los Angeles, is the chief promoter of the enterprise, and he has the contract to build the road. It will extend from Bowie, Ariz., on the Southern Pacific, north along the Gila River to Globe, in a rich mining district, the distance being about 130 miles. The route for 70 miles is through the Gila Valley, in Graham County, an excellent agricultural district. The construction work, it is promised, will begin at Bowie this month.

Kansas, Oklahoma & Texas.—Articles of incorporation have been filed in Kansas. The company is organized to build a road from Arkansas City, Kan., southwest toward El Paso, in Texas. The directors are: W. S. Nelson, H. A. Younge, W. H. Campbell and W. C. Huckett, of Kansas City; Charles French, of Chicago; A. J. Hoskinson, of Garden City, Kan., and Adelbert Carroll, of New York.

Philadelphia & Frankford.—The Special Master has recommended, in the United States Circuit Court, that the Philadelphia & Reading Receivers be authorized to make the agreement with the Committee of Bondholders and other creditors of the above company providing for the completion of the line. Under this agreement the bondholders will advance $250,000 for construction purposes.

Pittsburgh, Morgantown & Fairmont.—The work of ballasting this line from the north end is progressing as rapidly as it can be done. Forty-five car loads of furnace slag is delivered daily. It is now expected to have the road open for traffic before March.

Plymouth County.—The organization of this company to build through Plymouth County, Mass., will soon be completed. John F. Simmons, Equitable Building, Boston, is President, and Erastus Worthington, Jr., Exchange Building, Boston, is Engineer. The route is from East Weymouth through Hanover, South Hanover, Norwell and Marshfield to Brant Rock, connecting with the Hanover branch of the Old Colony road by a track through Marshfield, Pembroke and Hanover. It touches the Old Colony road at three points, East Weymouth, Hanover and Marshfield. The line surveyed is about 25 miles long, but the survey thus far made is merely a preliminary line.

Roanoke Belt.—A bill to charter this company has been favorably reported on in the Virginia Legislature. It is proposed to build a road north of Roanoke for about 30 miles to reach rich mineral lands, but the identity of those interested in the company is not disclosed. The road will extend from Roanoke through Roanoke, Bedford and Franklin counties, to connect with the Richmond & Danville, near Rocky Mount. It will connect at Roanoke with the Norfolk & Western. G. W. Crumpecker, of Roanoke, is the local attorney.

Roaring Creek & Charleston.—Work on this line from a connection with the West Virginia Central & Pittsburgh, near Elkins, to the property of the United States Coal & Mfg. Co., 20 miles down Roaring Creek, in West Virginia, is well under way. The connection with the West Virginia Central & Pittsburgh on the east side of the Tygarts Valley River is almost completed, and the bridge will be completed in a few days. It will be a steel girder bridge, with a span of 120 ft., and the foundations are already in place. Wade & Connelly are doing this work under the direct supervision of Capt. John Potts, the Superintendent in charge. Contractor Matthew King has a force of 200 men at work on a heavy cut, three miles from the bridge, the heaviest piece of work on the line. This will practically complete the grading of the line, and the tracklaying will then be pushed rapidly and trains will be running before March. The road will be primarily to develop coal and timber in the Roaring Creek Valley, but it will reach several good towns.

San Antonio & Gulf Shore.—The survey for this line east of San Antonio was begun last week by a party of engineers in charge of Thomas H. Millington. The contract for the first 50 miles, as reported last week, has been let to J. H. Flick, of Dixon, Ia., but nothing beyond the bare announcement that the contract has been let has been published concerning this part of the company's affairs. William Davis, the President of the new company, is endeavoring to secure a subsidy of $100,000 from the people of San Antonio, Tex.

South Side Extension.—The incorporation of this company to build an elevated structure in Chicago was completed last week. The line is to start from a point between Harrison street and Peck court and between State street and Wabash avenue, Chicago, northerly to Water street; to a point between the lake and Michigan avenue. The incorporators are Marcellus Hopkins, W. R. Champlin, E. L. Lobdell, and William W. Gurley, of Chicago, and David R. Lewis, of Evanston. The new company has been organized for the purpose of extending the Chicago & South Side elevated down town. The franchise of the Alley road only allows it to run to Van Buren street, and it was necessary to organize a new company in order to get a franchise for an extension to Water street.

Texas Midland.—The contract for the short branch from Roberts, the present southern terminus, to Ennis, Tex., has at last been given out, the award being made to the Bethune & Craney Construction Company, of Kansas City. The work has already begun, and as the right of way matters, which have delayed the building of the line so long, have been finally settled, work will doubtless be finished in a very short time.

Williamsville, Greenville & St. Louis.—This company has filed articles of association in Missouri. The capital stock is $1,000.000, and the stockholders are: H. N. Holliday, C. W. White and C. A. Haynes, of Williamsville, Mo.; E. S. Orr and F. A. Wann, of St. Louis, and Eli Klotz, of Piedmont, Mo. The road is to be constructed from Williamsville, in Wayne County, through the counties of Madison, Bollinger, St. Francis, Perry and Ste. Genevieve, a distance of about 100 miles.

Wyandotte & Southeastern.—The incorporation of this company in Arkansas has already been noted. The road is projected by Hamlin & Co., of Portland, Me., to develop timber property of the firm located in Arkansas. That firm now has in operation 10 miles of narrow gage railroad which will be changed to standard gage. The new line will be 25 miles long altogether and will connect Wyandotte on the St. Louis, Iron Mountain & Southern with Little Rock. The maximum grade will be 17 ft. to the mile. B. F. Copeland, of Little Rock, is Manager.

GENERAL RAILROAD NEWS.

Altoona, Clearfield & Northern.—Samuel P. Langdon, of Philadelphia, Receiver of this road, has petitioned the Blair County courts for the removal of his co-receiver, Frank C. Patterson, of Altoona, Pa., alleging that the defendant is attempting to transfer the control of the road to the Pennsylvania. The receivers represent conflicting interests and the litigation in which the road has been involved has been detailed in these columns on previous occasions.

Annapolis & Baltimore Short Line.—This road was sold at Baltimore last week under foreclosure proceedings, for $100,000, to George Burnham, Jr., representing the first mortgage bondholders. The road is about 22 miles long, and extends from Annapolis to Clifford Station, on the Curtis Bay branch of the Baltimore & Ohio. The passenger terminus of the road in Baltimore is at Camden Station. The company defaulted in the interest on its bonds, and Charles A. Coombs, who had been acting president for four years, was appointed receiver upon the application of the bondholders in March, 1893. The decree for the sale of the road was granted in October, 1893.

Bedford Belt.—It is announced that this road, which was built in 1892 by W. L. Breyfoygle, of Louisville, and W. C. Windstanley, of Bedford, Ind., is now controlled by the Baltimore & Ohio Southwestern. The company operates about 12 miles of road, six miles of this being main line. The cost of the road is given by the company as $550,000.

Chattanooga Southern.—The foreclosure sale of this road, which was to have occurred at Chattanooga on Feb. 20, has been postponed on the petition of the bondholders until June 20. The management of the property by the present Receiver, W. T. Burke, is satisfactory to the security-holders, and the bondholders feared that if the sale was forced at the present time the property would be sold for much less than it would bring in ordinary times.

Chicago, Burlington & Quincy.—The financial exhibit for December and the fiscal year to Dec. 30 is shown in the following statement of earnings and expenses:

Month of December.	1893.	1892.	Inc or dec.
Gross earnings	$2,896,230	$3,544,275	D. $648,045
Oper. expen.	1,714,285	2,215,711	D. 501,426
Net earnings	$1,181,945	$1,328,564	D. $146,619
Fixed charges	830,000	815,075	I. 14,924
Surplus	$351,945	$513,489	D. $161,543

Operating expenses were 59.3 per cent. in 1893, ag ainst 62.2 per cent. in 1892.

Year 1893.			
Gross earnings	$38,356,483	$40,412,401	D. $2,055,918
Oper. expen.	24,502,189	26,158,996	D. 1,656.807
Net earnings	$13,854,294	$14,253,405	D. $399,111
Fixed charges	9,960,000	9,780,900	I. 179,099
Surplus	$3,894,294	$4,472,505	D. $578,210

Operating expenses were 63.8 per cent. against 64.7 per cent in 1892.

Freight earnings for December were $1,948,962, a decrease of $491,075; for the year $24,229,767, a decrease of $3,257,184. Passenger earnings for December $588,853, decrease $150,390; for the year $10,185,380, increase $1,279,452.

Cleveland, Lorain & Wheeling.—This company has discontinued the use of the bridges and tracks of the Wheeling Bridge & Terminal at Wheeling, W. Va., and now has its terminus for passenger traffic at Bridgeport, Ohio, across the Ohio River from Wheeling. It is still using the Terminal system for freight. The reason for the change is to gain greater convenience for passengers. The distance from Bridgeport by way of the Terminal tracks is six miles, and most of it must be run slowly. By the street railroad the distance is only a mile, and can be made in 10 minutes.

Delaware, Lackawanna & Western.—The annual report of the company for the year ending Dec. 31 gives the following results of the year's operations, as compared with previous years:

	1893.	1892.	1891.
Gross earn.	$48,790,973	$46,226,283	$41,849,754
Oper. exp.	40,537,572	37,781,880	33,894,599
Net earn.	$8,253,401	$8,444,402	$7,955,164
Int. and rentals	5,360,489	5,366,406	5.418,226
Balance	$2,892,912	$3,077,996	$2,536.938
Betterments		464,539	121,474
Balance	$2,892,912	$2,613,457	$2,415,464
Dividends	1,834,000	1,834,000	1,834,000
Surplus	$1,058,912	$779,457	$581,464
On stock, per cent	11.04	9.98	9.21
Coal trans., tons	9,529,883	9,327,446	9,006,824

The operating expenses include new rolling stock, tracks and improvements.

Fitchburg.—Bills providing for the consolidation of the Brookline & Pepperill and Brookline roads, and other short branch roads, into this system are now pending in the Massachusetts and New Hampshire legislatures.

Georgia Southern & Florida.—The foreclosure sale of this road, which was to have taken place in March under a decree obtained by the bondholders, has been indefinitely postponed on petition of the Macon Construction Company, pending an appeal by that company to the Georgia Supreme Court. The appeal will be heard at the March term, and of course the date of the sale cannot be settled until the decision by that court. In the meantime the petition of the bondholders for the appointment of a Co-Receiver with W. B. Sparks, of Macon, who represents the interests of the Macon Construction Company, will come up before the courts. The bondholders will urge the appointment of S. Wilmer, of Baltimore.

Indianapolis, Decatur & Western.—The Reorganization Committee which purchased this road in the interest of the second mortgage bondholders at the foreclosure sale last March through its representative, Thomas B. Atkins, has defaulted in the payment of the purchased money. The court has refused further extensions of time and has ordered the resale of the property.

New York, Lake Erie & Western.—The following table shows the earnings and expenses of the road for the month of December and for the three months of the fiscal year:

Month of December:	1893.	1892.	Dec.
Gross earn.	$2,187,266	$2,539,136	$351,870
Oper. expen.	1,592,188	1,713,010	120,822
	$595,078	$826,126	$231,048
Due to leased lines	191,580	233,913	42,533
Net earn.	$403,698	$592,213	$188,515
Oct. 1 to Dec. 31:			
Gross earn.	$7,305,757	$7,880,872	$575,115
Oper. expen.	4,939,532	5,146,960	207.428
	$2,366.225	$2,733,912	$367,687
Due to leased lines	673,019	722,196	49,177
Net earn.	$1,693,206	$2,011,716	$318,510

New York & New England.—Thomas C. Platt, of New York, and Marsden J. Perry, of Providence, R. I., who were last week appointed Receivers of this road by Judge Wallace, of the United States Court of New York, were also appointed permanent Receivers for Massachusetts at the hearing before Judge Colt at Boston on Jan. 26.

New York & Putnam.—The consent of the New York State Railroad Commission to the lease by the New York Central & Hudson River Railroad Company of the New York & Putnam, formerly the New York & Northern Railroad, was granted this week. The conditions are that the lessees shall continue to afford at least as good service and accommodations as have heretofore been rendered by the New York & Northern.

Northern Pacific.—Judge Jenkins, of Milwaukee, has refused to grant an order as requested by President Ives and the present Directors of the railroad, directing the Receivers to deliver to the Directors the account books, corporate seal and other similar property of the company now in the possession of the Receivers, the Judge holding that such property should properly remain in the custody of the Receivers.

Philadelphia & Reading.—The following table gives the earnings and expenses of this road for the month of December, 1893, as compared with the same period of 1892:

	1893.	189'.	Inc. or Dec.
Gross earnings	$1,752,511	$1,968,367	D. $215,855
Oper. expen.	972,284	1,092,523	D. 120,238
Net earnings	$780,227	$875,844	D. $95,617
Other income	59,788	33,520	I. 26,268
Profit for month	$840,015	$909,364	D. $69,349
Fixed charges.	720,000	718,679	I. 1,321
Total charges	$923,847	$906,754	I. $17,093
Deficit	$83,832	Sur. $2,610	I. $86,442

Ths gross earnings of the Philadelphia & Reading Coal & Iron Co. for December were $2,279,310, or $573,965 greater than in 1892. There was a surplus of $9,132 against a deficit of $119,577 in 1892.

TRAFFIC.

Traffic Notes.

The Central Vermont is now running a dining car between St. Albans and Montreal.

The Northern Pacific now limits round trip local tickets to 30 days from date of sale.

Passenger rates from Pueblo and Denver to the Missouri River are demoralized, cuts of $1.50 being freely made.

A movement is on foot to advance the rate for berths in tourist cars to $6 from Chicago to Pacific Coast points. The present rate is $4.

The Interstate Commerce Commission has filed a bill in the United States Circuit Court at Montgomery, Ala., against the roads that were ordered to discontinue discriminations against the town of Troy, Ala., in the well-known case entered by the Board of Trade of that city before the commission. It appears that they have disregarded the order. The case will be heard on Feb. 19 and the principal defendants are the Louisville & Nashville, the East Tennessee, Virginia & Georgia, the Georgia Central, the Alabama Midland and the Western of Alabama.

The General Managers of the Trunk lines and Central Traffic Association roads have formally approved both the freight and the passenger agreement which have lately been formulated by the traffic officers, and which were noticed in the *Railroad Gazette* of Jan. 12 and 19. It appears, however, that the details which were left unfinished are still unsettled, and the present approval practically returns the agreements to the traffic officers for the consideration of these points. The principal questions to be adjusted are the payment of commissions on tickets outside of the territory of the roads interested, and the agreement upon percentages, and the method of equalization on freight. The passenger agreement is to cover only the traffic from competitive points.

Chicago Traffic Matters.

CHICAGO, Jan. 31, 1894.

The trans-continental passenger situation is now in much worse shape than prior to the later conferences of the Northern lines. The present situation has been brought about by the action of the Union Pacific in first giving notice that the Receivers had decided that it should not become a party to any agreement, and subsequently giving notice that, commencing Feb. 1, it would quote rates of $40 from Missouri River to Puget Sound points, $40 and $30 to Spokane and $35 to Montana common points. The effect of this will be to reduce the rate from Chicago to Portland $19, and will at once wipe out the concessions obtained by the Canadian Pacific. This action will have to be met by the St. Paul lines, and will probably result in the withdrawal of the Santa Fe from the Western Passenger Association on the ground that the Union Pacific has practically given notice that it will make any rate it pleases. It is also found that this action will lead to the disruption of the Western Passenger Association immigrant agreement. It is difficult to see how another general demoralization in all Western passenger rates can now be avoided; still the more conservative managers have not yet given up hope.

The Santa Fe since it went into the hands of Receivers has found itself in the same predicament as the Erie in respect to meeting secret cuts made by its competitors. The general practice followed by all Missouri River lines has been to quote a proportional rate only on grain from these points to Chicago, as the bulk of the grain originates beyond the river. Last week the Santa Fe gave notice that, effective Jan. 29, it would quote a flat rate of 9 cts. per 100 lbs. on wheat and 8 cts. per 100 on corn from Kansas City to Chicago, alleging as a reason therefor that its competitors were quoting such rates in violation of the agreement. These rates are lower than the existing proportional rates. The other lines met the reduction by reducing the proportional rates, but decided not to quote any flat rates until efforts had been made to get the Santa Fe to withdraw its tariff. This can be done if the other lines can satisfy the Santa Fe that they will quit this manipulating, as the Santa Fe is no more anxious to maintain the obnoxious tariff than its competitors are to have it.

There is considerable friction on account of the action of some of the St. Louis lines in applying direct St. Louis-St. Paul rates via Chicago on second-class business, which allows a cut of $1.50 St. Louis to Chicago and $2.50 Chicago to St. Paul.

The Freight Committee of the Central Traffic Association have agreed to present to the managers advances from 100 per cent. points east of Chicago. The result is an advance on all but sixth class of ½ to 2½ cents per 100 lbs.

The pass agreement of the Western lines is showing signs of collapse. It has already lasted longer than any of its predecessors.

The Western Passenger Association threatens to boycott the Pennsylvania, Big Four and Lake Erie & Western unless they stop the existing demoralization from Indianapolis to California points. It is said that tickets have been purchased at Indianapolis at a cut exceeding the entire proportion of the Eastern lines.

There is some speculation as to what the outcome will be of the action of the Southern Pacific in turning down Santa Fe tickets after Feb. 23. The date of going into effect is so far in advance, however, that it is quite likely the matter may be adjusted harmoniously. At present both lines are doing considerable talking, and the Santa Fe will get some advertising out of it.

The shipments of eastbound freight, not including lives tock, from Chicago, by all the lines, for the week ending Jan. 27 amounted to 58,004 tons, against 80,073 tons during the preceding week, a decrease of 22,069 tons, and against 80,042 tons for the corresponding week last year. The proportions carried by each road were:

Roads.	W'k to Jan. 26.		W'k to Jan. 20.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	4,307	7.4	6,387	8 0
Wabash	4,151	7.2	8,340	10.4
Lake Shore & Michigan South.	8,747	15.1	8,955	11.2
Pitts., Ft. Wayne & Chicago.	5,111	8.8	13,515	16.9
Pitts., Cin., Chicago & St. Louis	12,318	21.1	14,095	17.6
Baltimore & Ohio	2.964	5.3	3,090	3.8
Chicago & Grand Trunk	6,437	11.1	9,833	12 3
New York, Chic. & St. Louis.	4,692	8.1	5.603	7.0
Chicago & Erie	7,093	12.1	8,273	10.3
C., C., C. & St. Louis	2,184	3.8	1,980	2.5
Totals	58,004	100.0	80,073	100.0

Of the above shipments 3,981 tons were flour, 25,604 tons grain and millstuff, 11,314 tons cured meats, 10,466 tons dressed beef, 1,211 tons butter, 1,079 tons hides and 2,922 tons lumber. The three Vanderbilt lines carried 30.6 per cent., the two Pennsylvania lines 29.9 per cent.

(Other Chicago traffic news will be found on page 84).

A Government Form for Tariffs.

The Chairman of the Interstate Commerce Commission has issued the following circular:

"The Commission having determined to prescribe the form of schedules of rates and charges required by the Act to Regulate Commerce to be kept open to public inspection, in accordance with authority conferred by the sixth section thereof, and desiring that while fully meeting the requirements of the law the form adopted shall not be unnecessarily burdensome to the railways by reason of the expense or otherwise, it is thought proper to invite the carriers subject to the act to send representatives to a conference to be held at the office of the Commission, in Washington, on Monday, Feb. 12, 1894, when opportunity will be afforded to offer suggestions regarding the preparation of such a form (especially suggestions as to a form for joint tariffs) as will comply with the requirements of the statute. In the mean time the Commission will be glad to receive suggestions by letter from those interested."